The Electrical Industry's Weekly Magazine

August 26, 1957

Electrical World

Price 50 Cents

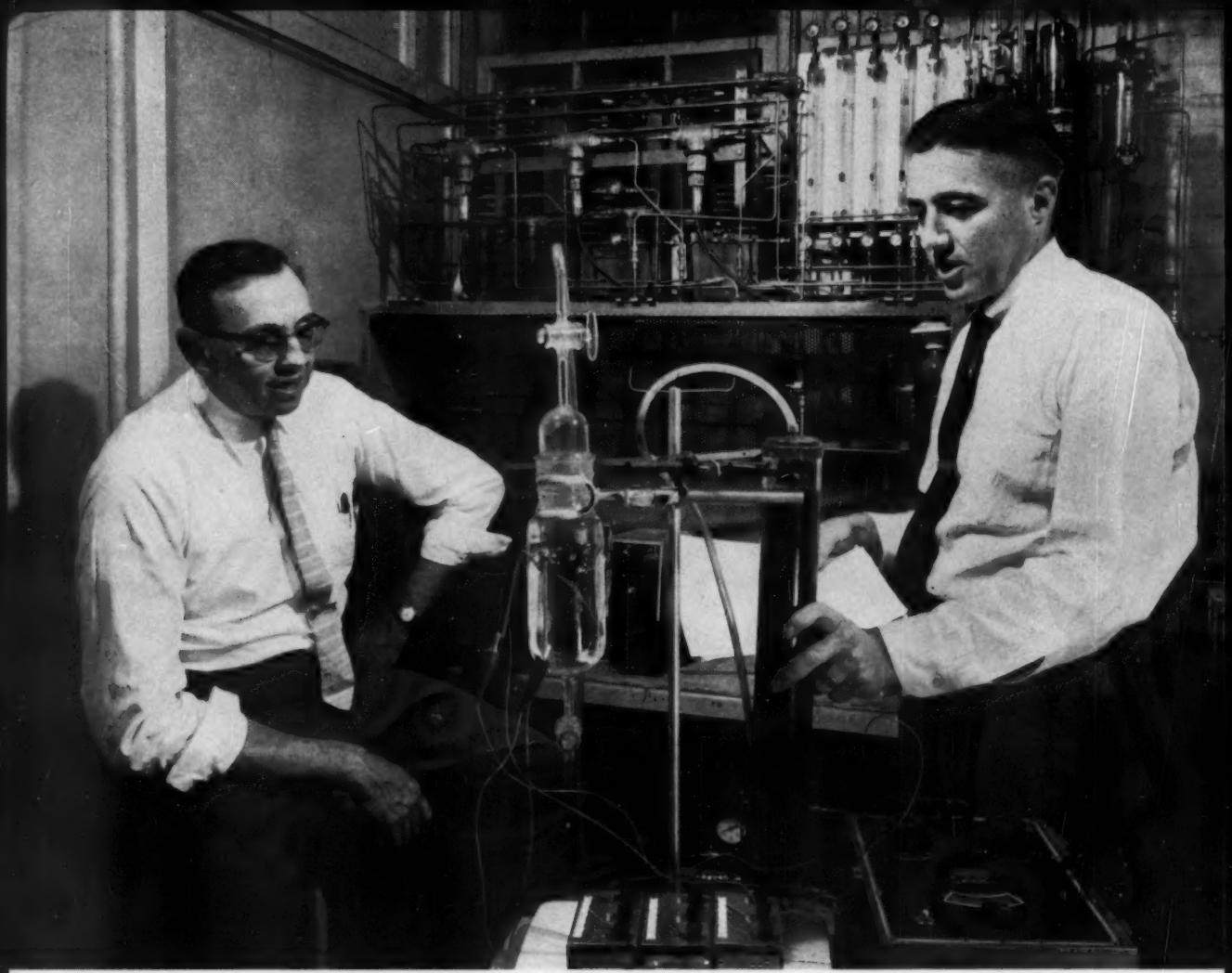
A McGraw-Hill Publication

EW Survey Examines "The Third Man" In HOUSEPOWER

. . . Page 63

How You Can Measure Transformer Quality . . . p 55

E B POWER QS W 12-
UNIVERSITY MICROFILMS IN
313 N 1 ST
ANN ARBOR MICH



INCREASED KVA AND GREATER DEPENDABILITY in large, 3600-rpm generators are possible through water cooling. Observing lab setup for gathering data on water cooling under simulated generator operating conditions are General Electric's C. H. Holley (left), Generator Advance Development Engineer, Large Steam Turbine-Generator Dept., and Dr. G. V. Browning, Physical Chemist, Materials and Processes Lab.

General Electric sees water a promising coolant for tomorrow's large generators

In recent years manufacturers of large, 3600-rpm generators have successfully applied two conductor-cooling methods—liquid and gas—to cool the stators of generators for electric utilities. But as growing load demands units of higher and higher capability, the question arises—which method offers most promise for cooling the larger machines of the future?

LIQUID VERSUS GAS

General Electric, the only U.S. manufacturer experienced with both liquid and gas conductor cooling of generator stators, has found that liquid cooling is far superior. Its superiority will prove even more significant as generator ratings increase. Compared to gas-cooling, liquid systems permit higher kva per unit size, simpler construction and maintenance, and better overall dependability.

WATER MOST PROMISING

Laboratory tests of possible cooling liquids at General Electric Company's Large Steam Turbine-Generator Department indicate that several advantages of water make it potentially the best coolant for generator stators. For example, water has several times the ability of oil to conduct heat away from generator stator bars.

ANTICIPATES UTILITY NEED

General Electric's research and manufacturing leadership in improving generator cooling systems is the result of a continuing effort to meet utility needs with the most effective equipment. For more information on liquid cooling of large generators, contact your General Electric Apparatus Sales Office. General Electric Company, Section 301-366, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 148, No. 9 August 26, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

Electricity Wins Victory in Arkansas

Gas company's request for investigation boomerangs as heat pump contract for Air Force is ok'd.....p 44

What Next for Liberalized Depreciation?

FPC will explore three accounting proposals in search of a uniform method. Here are pros and cons.....p 48

DISTRIBUTION

Vacuum Units Switch Capacitors

Switches show favorable economics at subtransmission and distribution voltage levels.....p 59

GENERATION

Put Spinning Reserve on Automatically

New controls act in 9½ sec to detect system frequency drop; change stand-by from motoring to generating....p 52

SALES

Housepower Outlays Are Going Up

Local expenditures mount, but sales methods and techniques reveal many approaches.....p 63

SUBSTATIONS

Measure Quality of Transformers

Factors of loss product and loss ratio provide large transformer users with a yardstick.....p 55

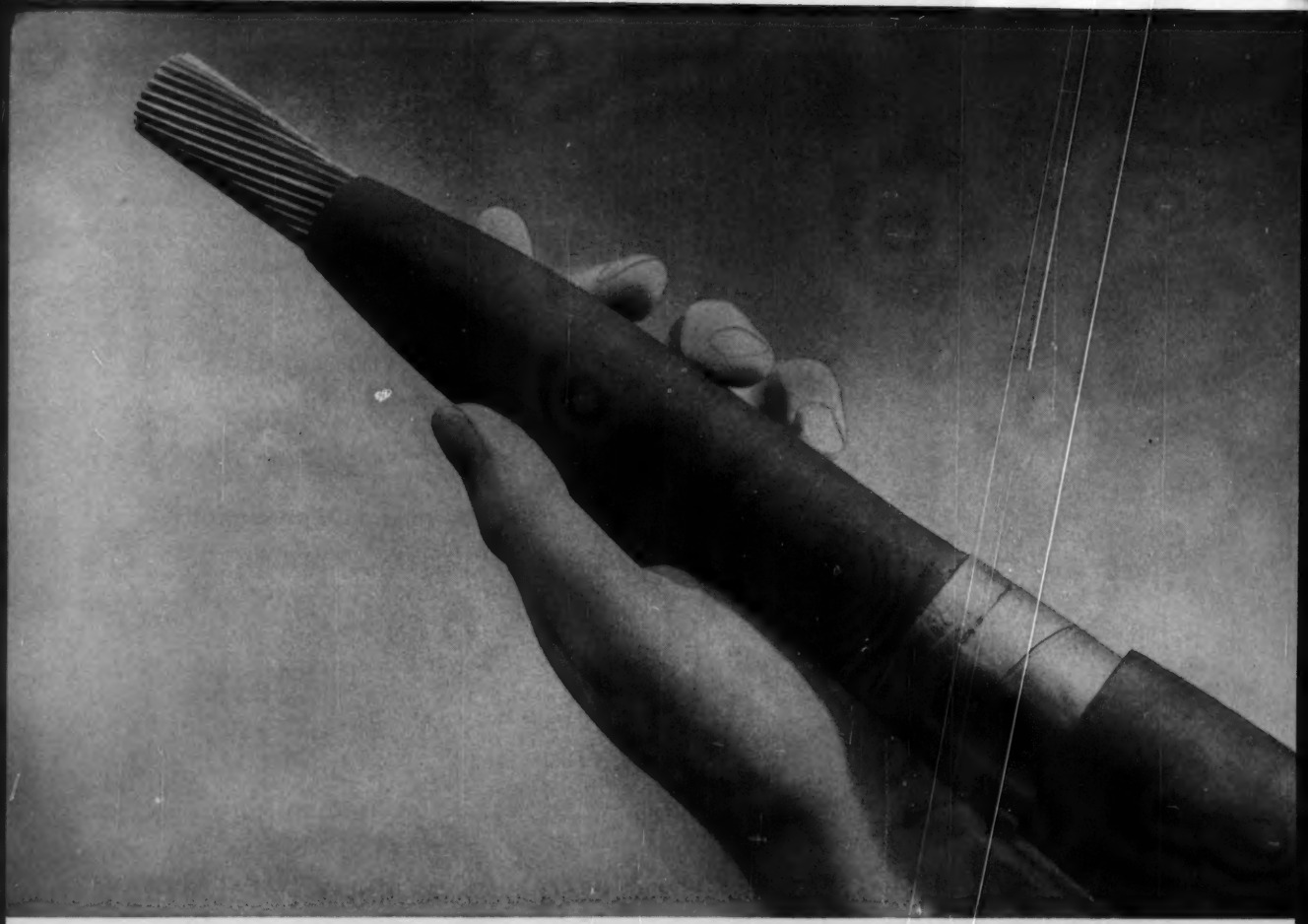
Dry Chemical Passes Test

Proves alternative to automatic water deluge system for fighting transformer fires.....p 60

Departments

Atomic Progress 50
Editorials 43
• Electrical Newsletter 19
Engineering Reference Sheet.... 78
Engineering Trends 22
From the Publisher..... 5
Heating & Cooling..... 82
How To 74
• Management Newsletter 99
Manufacturers and Markets..... 94
Meetings Calendar 110
New Equipment 86
News About People.....105
News-Beat 51
Selling 80
Washington Wire 46

INDEX TO ADVERTISERS.....119



Here's the cable that beats heat, moisture and ozone—KEYSTONE BUTYL

Ready for splicing, this Keystone butyl-insulated cable will soon be fighting the three most common saboteurs of electrical cable.

HEAT. Conductor temperatures of up to 90C don't faze Okonite Keystone butyl-insulated cables. This means (a) given conductor sizes can carry heavier loads, (b) given loads can be carried on smaller cables, (c) cables can work in such hot surroundings as boiler rooms and crowded ducts without fear of failure.

MOISTURE. Keystone butyl-insulated cables leave industry standards far behind . . . retain stable electrical and physical characteristics in the wettest installations. Here's clear proof that these cables may be used with confidence even for direct burial in damp locations.

OZONE AND CORONA CUTTING. Keystone butyl-insulated cables withstand a longer test period and sharper bends than required by the industry for ozone-resistant compounds. In actual operation, these cables have met even higher requirements for superior stability and long life—Okonite's *own* standards.

Write for the Keystone butyl story—complete. Over 12 years of field service and tests, with charts and graphs of test results . . . plus 36 pages of technical data to aid in specifying and installing the right cable for the job . . . have gone into Okonite Bulletin EW-463. Write The Okonite Company, Passaic, N. J.

4811

where there's electrical power . . . there's **OKONITE CABLE**

Electrical World Staff

Fischer Black Publisher and Editor
Daniel T Braymer Assistant to the Editor

Engineering

Leonard M Olmsted Managing Technical Editor
John J Kearney Assistant Managing Technical Editor
Howard S Knowlton New England Editor
Edward Allen Midwestern Editor
Francis J Kovalcik Middle Eastern Editor
David Rea Southeastern Editor
James G Plunkett Northeastern Editor
Charles F Hochgesang Western Editor
Archer E Knowlton Consulting Editor

News

Herbert R Frankel Managing News Editor
Rue M Shoop Associate Editor
Allen Long News Editor **Michael G Duerr, Theodore Fuller** and **Denise Hennessy** Assistants
Thomas R. Jordan Commercial Editor
Kenneth N MacLean Industrial Editor
George B Bryant, Jr Manager, Washington Bureau
V Craig Richter Washington Correspondent

Special Services

Arthur J Stegeman Manager, Market Research
Dexter M Keezer Director, Economics Department
E Russell Eggers Economist

Production

Jesse A Mock Manager of Production
George Swift Assistant Manager of Production
Frank C Stockman Art Director
H Tomlinson Howland, Jr Production Editor
Elaine Maguire Assistant Production Editor

Advertising

Warren W Shew Sales Manager
District Managers: N V Palmer, E S Chapin and D J Roberts, New York; E S Chapin, Boston, F P Coyle, Philadelphia; M S Kearney, Cleveland; M I O'Connell, Detroit; W H Meneilley and J T Schaefer, Chicago; J T Schaefer, St. Louis; Russell Antles, Los Angeles; R C Alcorn and T H Carmody, San Francisco; Robert H Powell, Atlanta; Gordon Jones, Dallas.
Otto A Drechsel Business Manager
Donald K Ellis Promotion Manager

●

E Bryson Sessions Circulation Manager

. . . *from the publisher*

Would You Like to Know:

- How you can tank-mount an arrestor for 345-kv service right next to the apparatus bushings?
- About a way to meter tomorrow's heavy loads at the same cost and with the same equipment you buy today?
- How to guy a pole in five minutes — with one man?
- How existing poles can be used for bigger transformers?
- A way to cool down copper bus so it can carry up to 20% more current?
- How to survey voltages while you read meters — at no more cost?
- What you can do to use larger transformers without increasing the size of the wire on the system?
- How to minimize field balancing on your next turbine?
- How to install a suspension unit without tools?
- A new fast method for hanging secondary capacitors?
- Four new ways to cut cost of switch maintenance?

Every bit of this information — and more like it — appeared in the advertisements in Electrical World's Aug. 12 issue.

There is more of the same in this one.

Fischer Black

ELECTRICAL WORLD

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation, and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for directions regarding subscriptions or change of address.

Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. **Position and company connection must be indicated on subscription orders.** Send to address shown in box at right.

United States and Canada subscription rate for individuals in the field of the publication $6.00 per year, single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

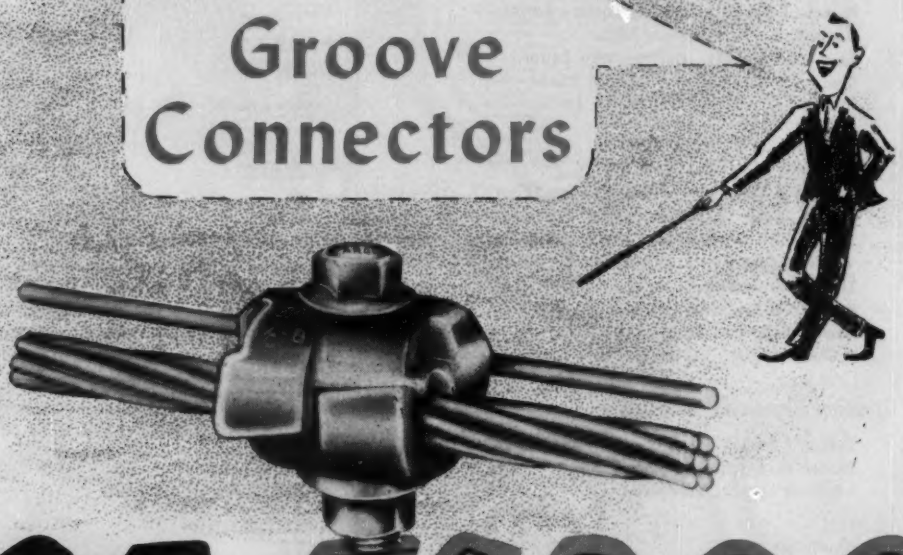
Second-class mail privileges authorized at Albany, N. Y. Printed in U.S.A.

Title registered in U. S. Patent Office. ©Copyright 1957 McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

SUBSCRIPTIONS AND ADDRESS CHANGES: Send subscription correspondence and change of address to Subscription Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.

if you use Parallel Groove Connectors



USE FARGO

Because . . .

1. interlocking finger design gives complete conductor encirclement and perfect alignment.

2. extra long contact areas assure good inter-strand connections and minimum "creep" . . . mass provides ample heat dissipation.

3. high strength heat treated castings and bolts eliminate breakage. Castings and washer are aluminum and bolts and nuts are steel with a heavy hot dip galvanize.

4. built in spring action maintains contact pressure under changing loads.

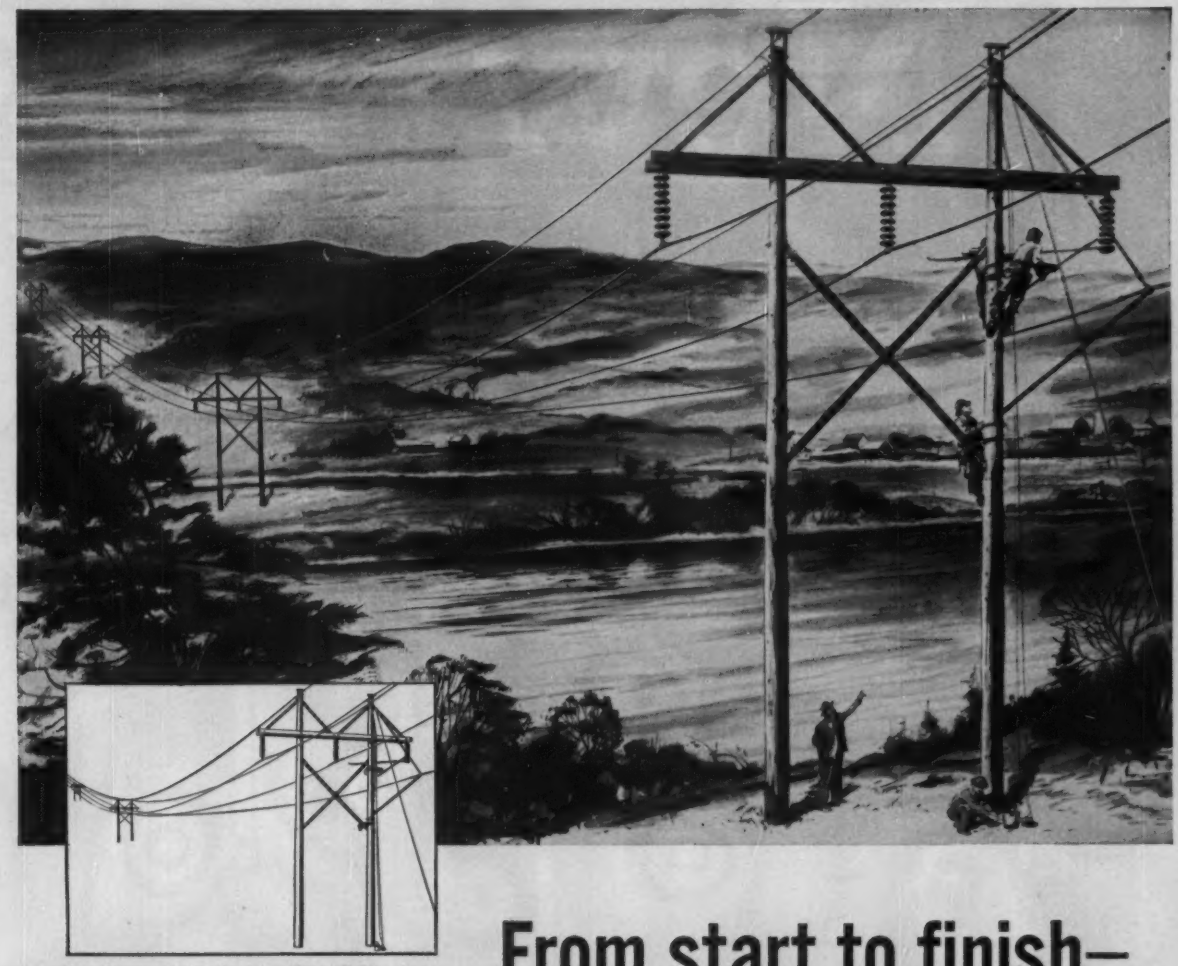
5. clamps are clearly marked and factory dipped in Fargolene, a corrosion inhibitor, which maintains clean contact surfaces.

6. a wide range of conductor sizes can be accommodated in each connector for aluminum to aluminum or aluminum to copper connections.

Ask your Line Material Field Engineer for complete details.

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York
FARGO



Graybar can supply everything that's shown above — except linemen and scenery — for line construction *and* maintenance. Poles, crossarms, hardware, tools—a partial list of items that are stocked at strategic Graybar locations throughout the country. All available for fast delivery to you. It pays to call Graybar . . . *first.*

From start to finish— arrange for continuing supplies and equipment—with Graybar

Engineers deep in the problems of new transmission *line construction* must be able to depend upon reliable, on-time deliveries to keep their schedules. And later, to meet the continuing task of *line maintenance*, the selection, dependable delivery and warehousing of supplies and equipment are vital.

Graybar backs up design and construction engineers to speed up these processes. Through more than 130 offices and warehouses, Graybar supplies prompt catalog information on everything electrical needed in line construction and maintenance.

To speed up the selection and delivery of anything and everything you need for line construction and maintenance call Graybar first. *Graybar Electric Company, 420 Lexington Avenue, New York 17, N. Y.*

713-98

CALL GraybaR FIRST FOR

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

New Allis-Chalmers

Ratings of FZO

14.4 kv, 500,000 kva to
69 kv, 3,500,000 kva

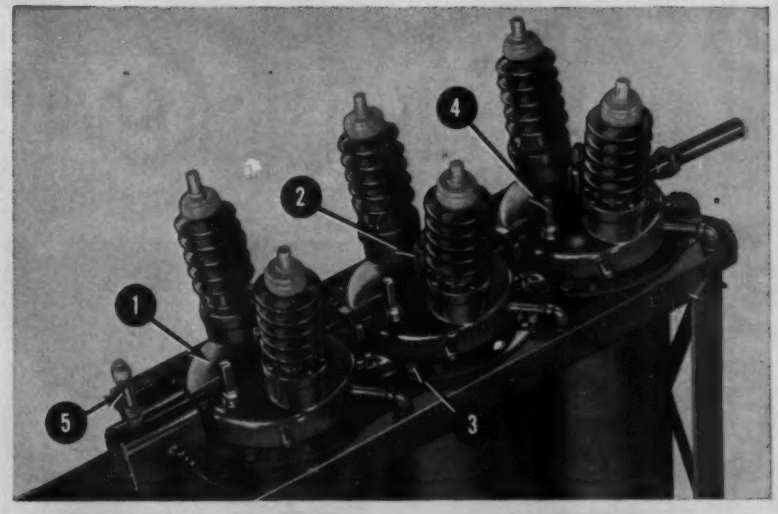
A-C ALLIS-CHALMERS

ALLIS-

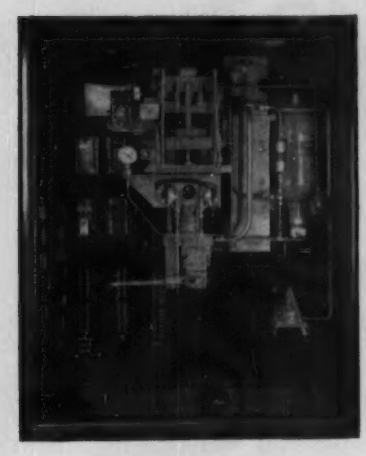
A-5256

FZO frame-type breaker

brings you these (4) features:



(1) New Top . . . including (1) self-cleaning, smooth fabricated steel top for each tank; (2) external adjustment of overtravel stop (without using feeler gauges); (3) only four bolts per tank for easy lowering; (4) high visibility float-type oil gauge and (5) ball-type position indicator visible from 360 degrees.



(2) Pneu-Draulic operator has few moving parts . . . has proved itself reliable in dozens of utilities throughout the country . . . provides full-speed emergency closing (using hand pump) even without control power.

(3) Turbo Ruptor device features tulip and bayonet contacts. These lessen mechanical impact forces through tapered design of bayonet and provide wiping action for positive contact. Multiple tulip segments eliminate contact bounce.

(4) Full Access to tanks and contacts. Access is unobstructed by frame members. In addition, lowering of tanks is simple; only four bolts hold each tank to the frame. Full tank skirt is provided on each tank to add stability when tank is on the ground.

...plus power-operated Tank Lifter

Eliminate hand cranking! Let hydraulic cylinders raise and lower tanks safely — effortlessly. This unique A-C feature is a natural extension of the *Pneu-Draulic* operator. Easily installed . . . cylinder rods slip into tank bolt holes at top of tank.

Easy to operate . . . simply open one of two valves to lower tanks — the other to raise tanks.

Safe . . . tanks will lower at predetermined speed even if hose and fittings are accidentally removed.

Lifter consists of two hydraulic cylinders and flexible hose. Hydraulic pressure is from the accumulator or pumps of the *Pneu-Draulic* operator system. If breaker doesn't have a *Pneu-Draulic* operator, a battery operated unit is available.

This is only one of many features brought about by the redesign of Allis-Chalmers frame-type breakers.

For details see Bulletin 71B8475. Contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

CHALMERS

Pneu-Draulic and *Turbo Ruptor* are Allis-Chalmers trademarks.

"Alcoa" starts with this...

to make

Long-lived, lightweight service drop

Photos courtesy of Aluminum Company of America, Pittsburgh, Pa.

Right from the start, "Alcoa" triplex service drop is engineered for easy installation and low maintenance. Its two conductors have an extruded covering of BAKELITE Brand Polyethylene.

This is a uniform, lightweight, weather-resistant covering. It is tough and flexible, and will not festoon. It permits longer spans, faster stripping and splicing, easier handling.

BAKELITE Polyethylene provides the same advantages when used on line wire and control cable. It is top-quality material, formulated specifically for these jobs by the company with the longest experience in plastics. For technical data on BAKELITE Brand Polyethylene and names of wire manufacturers who use it, write Dept. ZO-53.

BAKELITE
BRAND
PLASTICS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

The terms BAKELITE, UNION CARBIDE and the Trefoil Symbol are registered trade-marks of UCC.

Another world's record!

Once again ELLIOTT builds largest 2-pole induction motor

last year it was 5000
(see 1956 advertisement)

this year it's 6000 HP

3600 RPM

In fact, Elliott is now building *four* 6000-hp 2-pole squirrel-cage induction motors—all of them the largest ever built. The one shown under construction above (totally-enclosed, water-to-air cooled) will drive boiler-feed pumps for a large eastern utility.

Elliott's continued leadership is shown by the fact that Elliott has recently built or has on order 39 of the largest 2-pole machines . . .

- 11 motors . . . . . each 4500 hp
- 24 motors . . . . . each 5000 hp
- 4 motors . . . . . each 6000 hp

That's a lot of horsepower. And it reflects confidence in Elliott's long experience in building large 2-pole machines. The first large 2-pole motor ever built was manufactured by Elliott in 1916. Since then, Elliott has developed numerous design improvements including weather-protected motors, fabricated steel enclosures, and "super-quiet" machines. For complete information, write Elliott Company, Ridgway, Pa.

ELLIOTT Company

Ask for "Milestones" booklet
It gives the full story on Elliott 2-pole motor design

R7-25

Save $2920*

New APT high-voltage potential transformer . . .

greater metering accuracy, 50% more thermal capacity than other low-cost designs

The new Westinghouse Type APT potential transformer is designed for low-cost, positive protection and highly accurate metering. Its single-core-and-coil, single-bushing design holds the edge over both the conventional type and other low-cost designs.

Greater metering accuracy—This new transformer, 92-161 kv meets ASA 0.3 accuracy standards on burdens up to 500 volt-amperes; and, as shown in the graphs below, at 200 volt-amperes burden both its ratio correction factor and its phase angle deviation are only half as much as for other low-cost designs. This means more accurate metering under all conditions.

Higher thermal rating—The Type APT transformer at 115 kv, for instance, has a minimum thermal rating of 6000 volt-amperes.

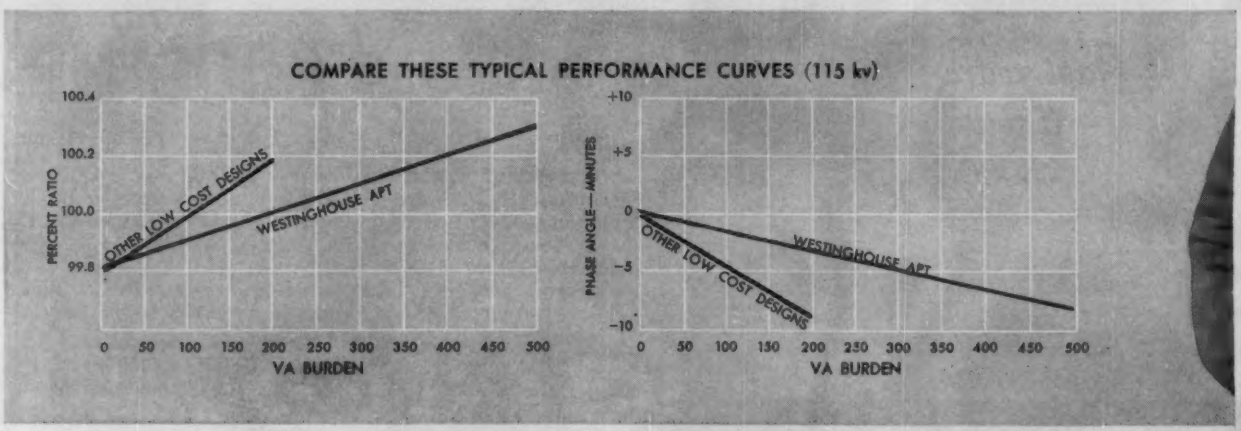
ASA Group 3 insulation—Designed for line-to-neutral operation, the APT utilizes Hipersil® cores fluxed for line-to-line voltage under emergency operating conditions.

Reduced size and weight—Solid insulation and exclusive Hipersil cores combine maximum performance characteristics with minimum size and weight.

For the full story of the performance of the Type APT transformer, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

*On a 138 kv APT potential transformer J-70818

YOU CAN BE SURE...IF IT'S Westinghouse



Lower percent ratio error and smaller phase angle deviation of new Westinghouse APT potential transformer contribute to substantially improved metering accuracy.

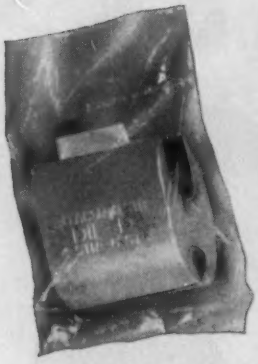
45% savings

New Type APT potential transformer, available in voltage classes from 92 through 138 kv, meets all ASA standards for high-voltage metering and relaying applications, and offers the following savings:

ESTIMATED NET PRICE COMPARISON

Insulation Class	BIL kv	Conventional Design	Westinghouse Type APT
92 kv	450	$4080	$2230
115	550	4930	2690
138	650	6460	3540
161	750	8110	4460

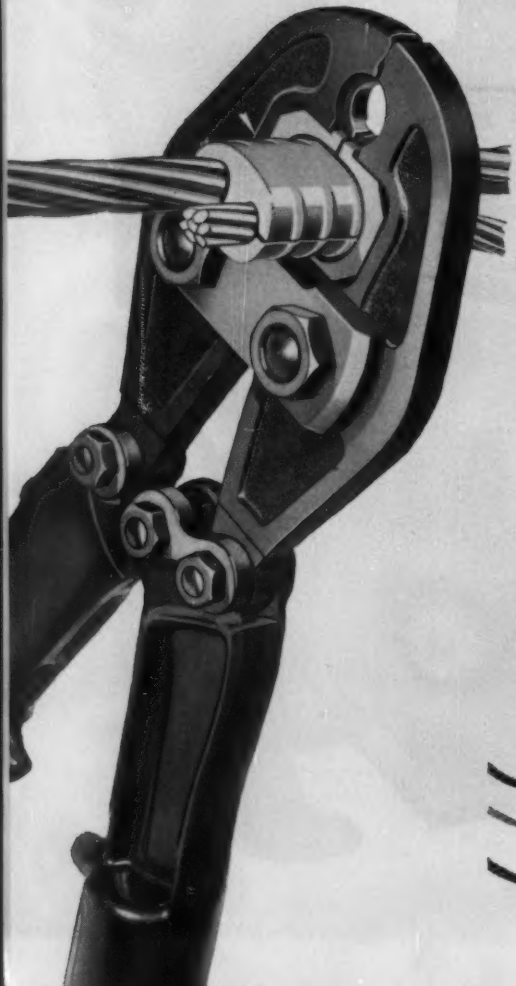
new... KEARNEY SQUEEZONS ...sealed in individual

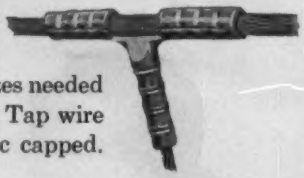


Here is the positive answer to a problem confronting every power company: how to make sure inhibitor is properly applied every time a tap is made. Now the inhibitor can't be forgotten or skipped — because Kearnalex is *pre-applied inside the Squeezon jaws.* The lineman simply rips open the plastic bag . . . inserts cleaned conductor into Squeezon jaws. Since Kearnalex compound is already in the groove, positive application of inhibitor is simultaneous with compression.

Squeezons are also available as formerly, for application of inhibitor on the job. But if you want to save even more time and labor, order Squeezons pre-packaged in plastic with Kearnalex already applied. That way, you'll be certain the job's done right . . . and that connections on your lines are made for keeps.

better connections . . . less time and labor with KEARNEY Compression Fittings





T-TAPS Heavy-walled, with extended contact areas—make stable connections under all load conditions. Only two die sizes needed to install complete size range of T-Taps. Tap wire sockets filled with Kearnalex and plastic capped.

L-TAPS For safely connecting copper to aluminum (line side or tap side) where atmospheric conditions would physically bridge spacers of Squeezons. Conductors widely separated by heavy aluminum section to prevent galvanic action between dissimilar conductors. Socket for tap wire filled with Kearnalex, and plastic capped.

T-TAP STIRRUPS Provide complete protection to aluminum conductors from arc damage when installing or removing hot line clamps. No armor rods needed—T-Taps will not twist on conductor. T-Taps can be compressed on live conductors; help reduce costs, especially for larger line conductors since smaller clamps can be used.

SERV-ENS Outstanding compression connector for splicing all combinations of ACSR, aluminum and copper for service entrances. Sockets filled with Kearnalex. As conductor enters socket, Kearnalex is forced over entire area of inserted wire. Solid metal barrier prevents over-insertion of conductors.

with inhibitor already applied plastic bags

GROUND ROD FITTINGS These Squeezon fittings improve circuit safety by eliminating open grounds and ground wire burn-offs caused by loose clamps. No screws or bolts to loosen, essentially tamper and theft-proof. Pure copper, safe for buried installations; low in cost and quickly installed.

GROUNDING LUGS Squeezon grounding lugs are used extensively for corrosion-free grounding of galvanized hardware, switch bases and similar equipment on transmission structures. Solid aluminum lugs compatible with galvanizing . . . either aluminum or copper wires may be used. Sockets filled with Kearnalex and plastic capped.

JAMES R. KEARNEY CORPORATION ***General Offices:*** **4224-42 Clayton Ave., St. Louis 10, Mo.**

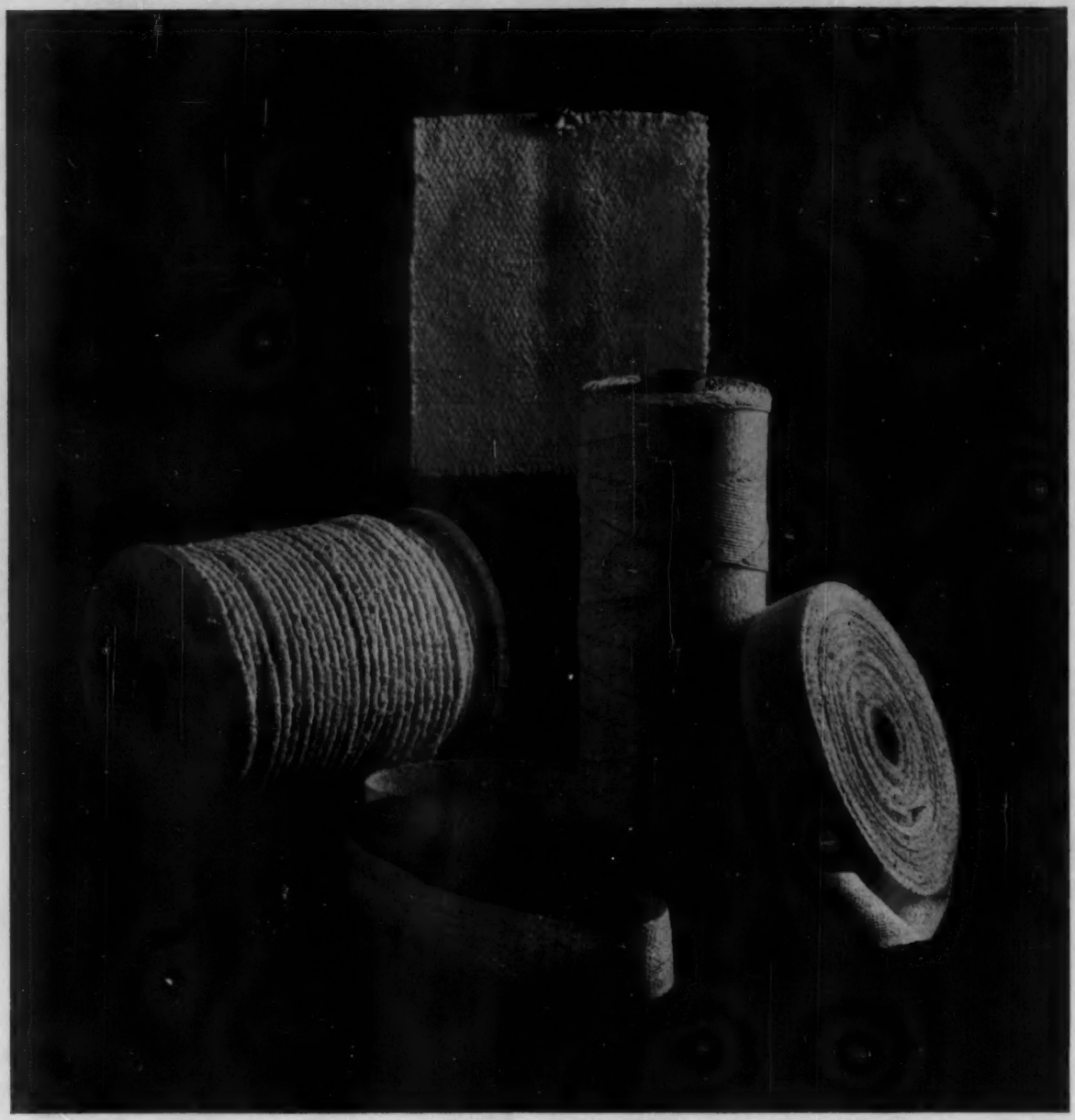
-376

for BETTER CONSTRUCTION
SAFER MAINTENANCE

Specify JAMES R. KEARNEY *The Mark of Quality*

KEARNEY PRODUCTS

Plants at: ST. LOUIS — FAYETTEVILLE, ARKANSAS — SHENANDOAH & CLARINDA, IOWA — GUELPH, ONTARIO, CANADA



Four Low-Cost Ways to Keep High Temperatures at Bay!

Flexible and fireproof K&M Asbestos Textiles insulate and protect wires, cables, coils and transformer leads from fire, high temperatures and chemicals.

Practically indestructible K&M Asbestos Textiles retain their electrical insulating qualities through a wide range of heat, humidity and weather changes.

High-tensile-strength K&M Asbestos Textiles reduce downtime due to technical failures.

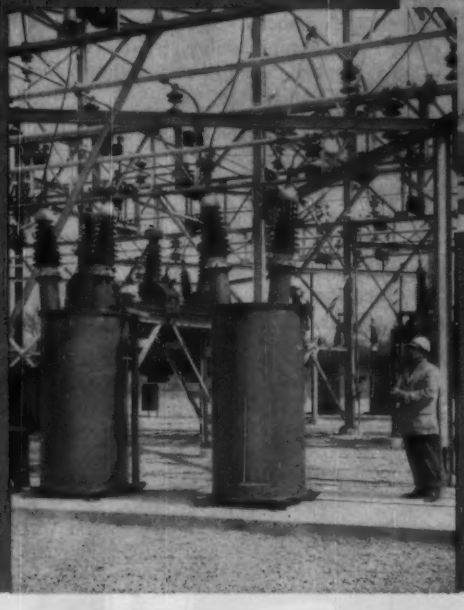
Economical K&M Asbestos Textiles give you protection at high operating temperatures at lower cost than other insulating materials.

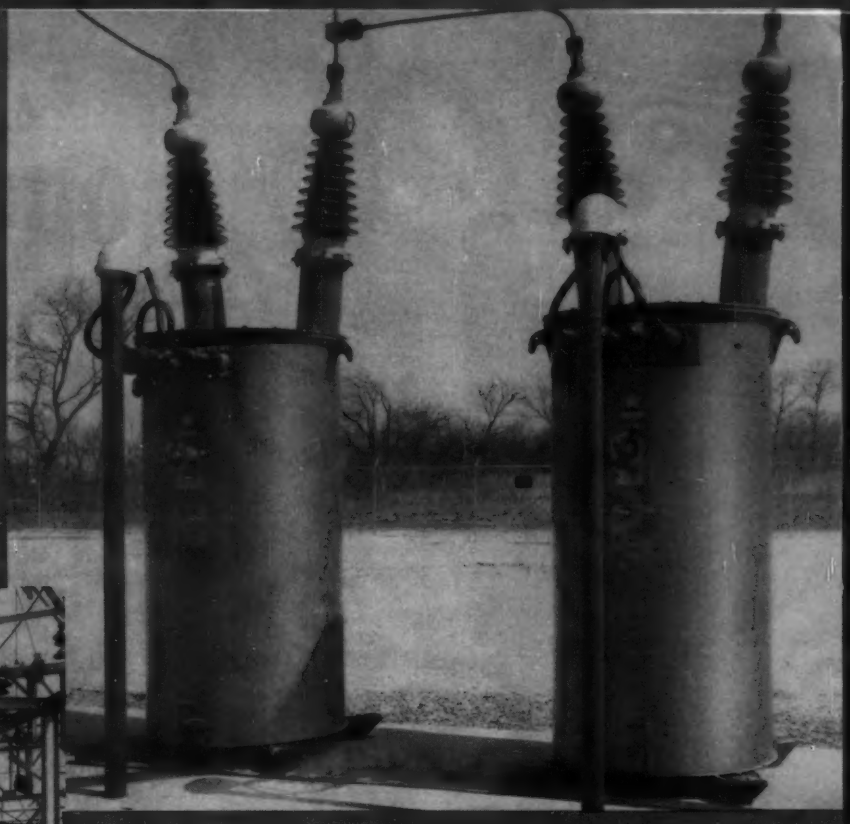
Write today for complete details on safe, economical K&M Asbestos Textiles.

K·M
BEST IN ASBESTOS

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

For its own SUBSTATION POWER CONTROL...





LONG ISLAND LIGHTING CHOSE HIGH VOLTAGE

Pole Star

DISTRIBUTION TRANSFORMERS

There is no other type of distribution transformer installation in which reliability is so vital. In this case, not just a few homes or commercial establishments are involved—but rather, operation of the entire Ruland Road Substation of Long Island Lighting Company, which ties a new 138-kv feeder into a 69-kv feeder.

Long Island Lighting chose four high voltage Pole Stars for this important installation, which provides "control power" for the fans, pumps, and tap changer of the main substation transformer, for the heaters and battery chargers of the switchgear, and for station lighting. The Pole Stars are 100-kva, 67-kv units connected as two open delta banks. The low voltage is 120/240 volts.

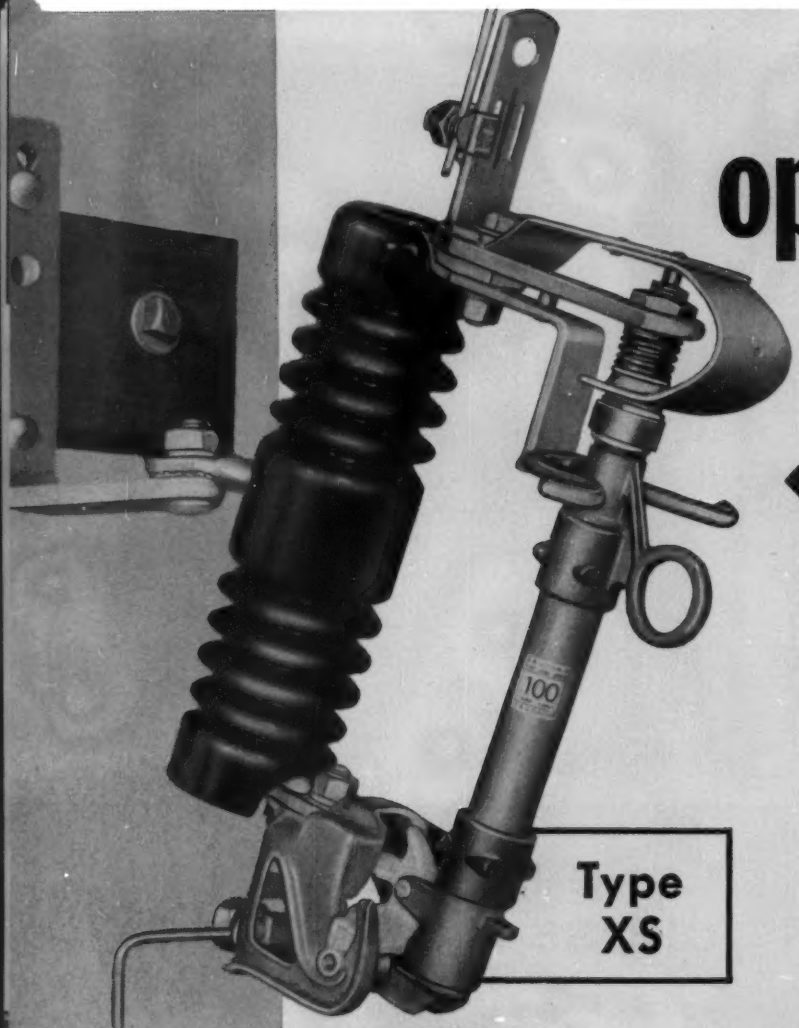
Pole Stars have won a fast-growing reputation for dependability in high voltage applications because they possess the *ruggedness* that is needed for day-in-day-out operation. For more details or a quotation on that next order, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

Pole Stars are available in all standard single-phase sizes from 3 through 500 kva, through 67,000 volts.

PENNSYLVANIA TRANSFORMERS — POLE STAR

PENNSYLVANIA DISTRIBUTION TRANSFORMERS



A SINGLE-VENTED

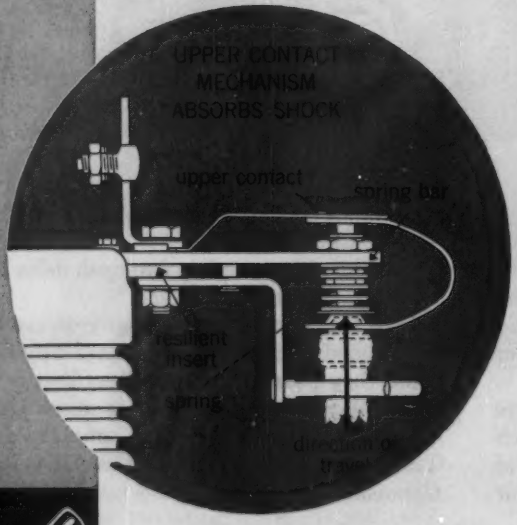
open cutout

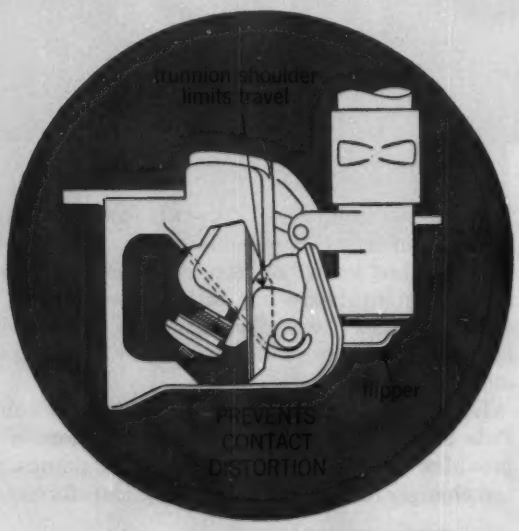
that will clear 12,000 amperes!

Significant new* developments by S&C now take the open cutout to exceptionally high levels of interrupting capacity without sacrificing low fault current interruption ability, without added cost, without double venting, and without disregard for linemen's safety.

- ✻ Controlled placement of fuse link shortens arc length — reduces gas generation.
- ✻ Multistep recoil action (from recoil bar, spring, resiliently mounted insert, contact) absorbs energy when fuse blows.
- ✻ Supplemental recoil action, when trunnion engages hinge casting, dissipates remaining energy.

The XS may be closed on 12,000 ampere faults (7.5 kv rating). And the patented "flipper" feature assures reliable interruption of low-current faults.





Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS • U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **A strong campaign will soon be waged** by all unions of AFL-CIO to have future labor contracts provide medical plans not only for union members but also for their dependents. The plan would involve such national electrical unions as IUE, IBEW, and UWUA.

A fall promotion of electric resistance heating is being considered by Public Service Electric & Gas primarily for auxiliary purposes. It would take the form of an exhibit for both the public and interested groups such as architects, electrical contractors, and dealers.

LATE NEWS ▶ **The 2,200 electrical workers at Alabama Power who staged a walkout** Aug. 16 in support of wage demands are now back on the job. The strike was caused by company rejection of a 7% wage increase during wage reopener negotiations. The utility had offered a 5% hike. Meanwhile, negotiations have been resumed.

Montana Power Co has asked the PSC to approve a rate boost of 12 to 19%. It estimates the proposed increase would net an additional $1.8 million in 1958.

An internal fire breaks out, but is quickly extinguished, in a medium size industrial type gas turbine under test at General Electric's Schenectady plant. At the first signs of smoke, power was shut off. On-the-spot investigation showed that a couple of plates had sprung, apparently as a result of pressure being built up by the fire. There was no explosion nor damage to the test stand or building. Turbine is being dismantled for investigation.

A new Wisconsin law restricts the PSC in approving a utility's request to abandon a right of way. The legislation, just signed by Gov Vernon W. Thomson, now requires an electric or telephone utility to remove all poles at ground level and to remove any other structures extending over three feet above the ground.

Commonwealth Edison hit a new all-time peak of 3,800,000 kw on Aug. 15, topping previous high of 3,734,000 kw established Dec. 26, 1956. Peak load was handled without any outside emergency aid.

A Duquesne-Light electrician was killed recently by a gas explosion in a 60,000-kw turbo generator which had been shut down for routine repairs. The explosion is attributed to a spark from an electrically-driven hand blower which ignited a pocket of hydrogen gas. The pocket apparently had not been removed when the generator windings were purged of hydrogen by means of carbon dioxide.

Congratulations . . . Alabama Power elects Walter Bouldin as its new president and elevates L. M. Smith, his predecessor, to vice chairman of the board. E. C. Easter rises to executive vice president . . . Florida Power Veep George F. Foley gets additional duties as secretary, treasurer, and member of the board of directors . . . Edwin N. Gadsby is sworn in as Securities & Exchange Commission member and is immediately named chairman by the President.

ELECTRICAL WEEK

A TWO-MINUTE

HOUSEPOWER ▶ **Housepower's biggest current problem**—wooing more and better electrical contractors into the program—is examined in an 8-page report based on a special Electrical World survey.

Electric utilities have been boosting their local Housepower expenditures (more than 40% per residential meter in '57 over '56), but utility techniques present a mixed picture.

Contractors' side of the picture is presented by Oliver Burnett, National Electrical Contractors Assn prexy. He says contractor has to be shown some way in which he can make a faster dollar in Housepower. Utilities will have to provide the answer (p 63).

WASHINGTON ▶ **In tallying up the results of the recent Congress, our box score** reveals that partnership emerged the victor. The administration, with staunch support from the House, chalked up a number of victories, symbolic and real. Not only did it overcome the lead the Democrats held at the beginning of the session, but it was able to weaken recurring Democratic threats (p 46).

EVENTS ▶ **Electricity wins a decisive victory over gas in Arkansas,** paving the way for what is believed to be the first all-electric heat pump housing project in the world (p 44) . . . The Senate passes a federal insurance program that will pay up to $500 million in damage claims arising from any reactor accidents (p 47).

DISTRIBUTION ▶ **Iowa P&L is still counting the advantages of the pole-type sheds** it recently erected to protect its motorized equipment from inclement weather. The structures, which enable vehicles to start fast in emergencies, were built at a cost of less than $1 per square foot, thus slicing construction costs by about 50% (p 76).

A small gas cylinder is the new load break feature of enclosed cut-outs. The device, inserted easily in the 100-amp cutout by a lineman, enables the cutout to switch load currents to full rating of either the fuse-holder or the disconnect blade cutouts (p 74).

A new vacuum switch can switch capacitor banks at subtransmission and distribution voltages with favorable results. This is revealed by extensive field tests which indicate that 1) installation of the new device need not deviate from normal construction practices, and 2) that climatic conditions do not interfere with the necessary switching operation (p 59).

GENERATION ▶ **New automatic control scheme takes over in emergency** to change, within 9½ seconds, a stand-by hydro unit from motoring to generating. Now in operation at a Central Maine Power station, it is believed to be the first use of an automatic control scheme for a spinning reserve unit having a reaction-type turbine (p 52).

PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

SUBSTATIONS ▶ **Transformer users can specify their "transformer of the future"** more clearly if the progress of today's transformer manufacturers is evaluated in terms of the loss product and loss ratio factors. These two factors are the best yardsticks for measuring transformer quality, says A. N. Garin, of GE's large transformer department (p 55).

Fires in transformers can now be extinguished with a dry chemical, reveal recent mock-up tests by Pennsylvania P&L (p 60).

SELLING ▶ **Beetles, and even some termites, are powerless** against a new infrared lamp unit which, when placed on hardwood flooring, completes the kill in five to ten minutes. The unit, which draws 1.5 kw, is slated for manufacture by a Los Angeles firm . . . Microwave cooking will be practiced by at least 250,000 American housewives by 1965, predicts an executive of a range manufacturing company (p 80).

HEATING & COOLING ▶ **Managers of Indiana co-ops are warming up to the idea** of electric heat as a good load builder and a needed service to members (p 82).

MANAGEMENT ▶ **Tight money policy, now in a spectacular phase, may reach a climax** in the fall, when interest rates on long term government loans may rise to almost 5%, predicts Goodbody & Co. Only a natural softening of money or an excuse to change its policy—such as a crack in the stock market—can get Fed off the spot (p 101).

All eyes of financial utility people, security analysts, and state commissioners will be on the Sept. 17 FPC hearing on liberalized depreciation and accelerated amortization. Three methods will be discussed —normalized income, vintage-year, and a new reserve account (p 48).

PEOPLE ▶ **Newell Clark is named to head newly formed Merrimack-Essex Electric Co,** operating subsidiary of New England Electric System. Edward F. Ziegler is vice president-general manager. Rounding out the executive staff are William E. Casey, Thomas J. Hickey, H. Sherman Holcomb, Albert Leddy, and Ray Pike, Jr, all vice presidents (p 105) . . . At Southern Nevada Power, E. F. Johnson and D. R. Hoopes take over responsibilities formerly held by D. D. Smalley, who retires as vice president-operating manager (p 108).

MANUFACTURERS ▶ **Centralized electrical testing allows plant examination** of materials passing through and of finished products (p 94) . . . Doubly-oriented magnetic sheet material which can be magnetized in four directions has been developed to cut energy losses and noise levels (p 94).

NEW EQUIPMENT ▶ **Two new distribution transformers provide full current protection** for ratings from 10 to 100 kva. The second type also features a valve-type lightning arrester for surge protection (p 86) . . . New on the market is the U-bolt connector for general transmission and heavy distribution connections, taps, and loops (p 91).

ENGINEERING TRENDS

Gompertz curve is valuable in projecting utility trends. It is a growth curve whose rate of growth decreases at a constant rate with time in the curve's saturating form.

Decreasing differential between the cost of diesel fuel and cost of electric energy, smaller total investment and lower operating and maintenance costs for electric motive power enhance further railway electrification.

Boosting generator unit ratings may put, "too many eggs in one basket" according to some British engineers. They claim the gain in thermal efficiency is small and the saving in capital cost is likely to be marginal while the operating loss in case of a forced outage would be significant.

Solar furnaces aid research in atomic blast effects and high temperature metallurgy. These devices produce the highest sustained temperatures man has been able to generate and in the case of atomic research the desired temperature is obtained without radiation effects.

Rhenium, with the second highest melting point of all metals, is now considered superior to tungsten for electrical contacts and electron-tube construction.

Ultra-high-strength steel that can be heat treated to 285,000 psi ultimate with sufficient ductility for structural applications has been experimently produced by the National Bureau of Standards. The steel contains carbon, manganese, silicon, nickel chromium, molybdenum, titanium, and boron.

Single-phase, 25-kv, 60-cycle power has been officially endorsed by the Association of American Railroads for any future extensive main-line railway electrification. This clears the way for easy integration of railroad load into utility systems.

FROM EDITORS IN THE FIELD

Helicopter rental at $70 per hr provides economical line patrolling on Western Massachusetts Electric's system. Cruising speeds are between 25 and 30 mph. Blade tip is kept 30 to 50 ft away from outside transmission wires in checking flashovers, broken insulators, exposed counterpoise, washouts and right-of-way encroachments. Two men recently patrolled 332 miles of 115 to 13.8-kv lines in 10.5 hrs flying time. Same job by ground patrol would have taken 15 men with autos and trucks three weeks.

Why More Utilities Are Selecting L-M Type E Valve Arresters

L-M valve-type distribution lightning arresters have established an outstanding performance record by giving millions of service years of reliable protection. The Type E has been a leader in the field, and hundreds of thousands have been giving excellent service for many years. The failure rate is phenomenally low.

Here are some of the reasons for this remarkable record, and for the great increase in customer preference for the L-M Type E valve arrester.

Balanced Sparkover: Spark gap is a ladder-gap design, pre-set and then permanently sealed in the arrester housing. It cannot be knocked or burned out of adjustment. Gap is precision-made to assure optimum balance between 60-cycle sparkover and impulse sparkover.

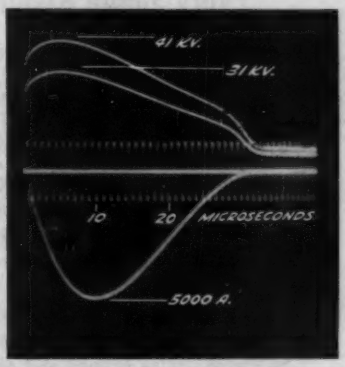
Low IR Drop: L-M now has a new Type E arrester, the E-3, which provides even lower IR drop than its popular predecessor. The new Type E-3 also provides greater durability and discharge capacity. These advantages are made possible because the new Type E-3 has an improved gap which provides greater 60-cycle interrupting ability, permitting reduction of the resistance of the valve element. The oscillogram shows the improvement in IR drop between the Type E and the new Type E-3.

Positive Protection: L-M valve arresters have a Pyrex glass housing which permits visual inspection of the spark gap in the field. Should the arrester become damaged, telltale evidence can be readily seen through the glass. If the arrester should fail to interrupt 60-cycle follow current for any reason whatsoever, L-M's patented Isolator provides positive assurance against grounding the feeder by disconnecting the ground lead from the arrester.

Other features include Zincilated (Zincilate No. 100) arrester housing clamp, fibre-glass cap, and fibre-form packaging. New packaging provides additional strength to the carton so arresters can be stacked easily on pallets.

Get Complete Information

Get the whole story of L-M arrester performance and application. Ask the L-M Field Engineer, or write for a copy of bulletin on the new Type E-3 arrester, to Line Material Industries, Milwaukee 1, Wisconsin.



Oscillogram shows reduction in discharge voltage in the new Type E-3 valve-type lightning arrester. Curves are for a 9 kv unit. IR drop has been reduced from 41 kv to 31 kv—a remarkable improvement in a unit that already has established an enviable performance record over many years' service.

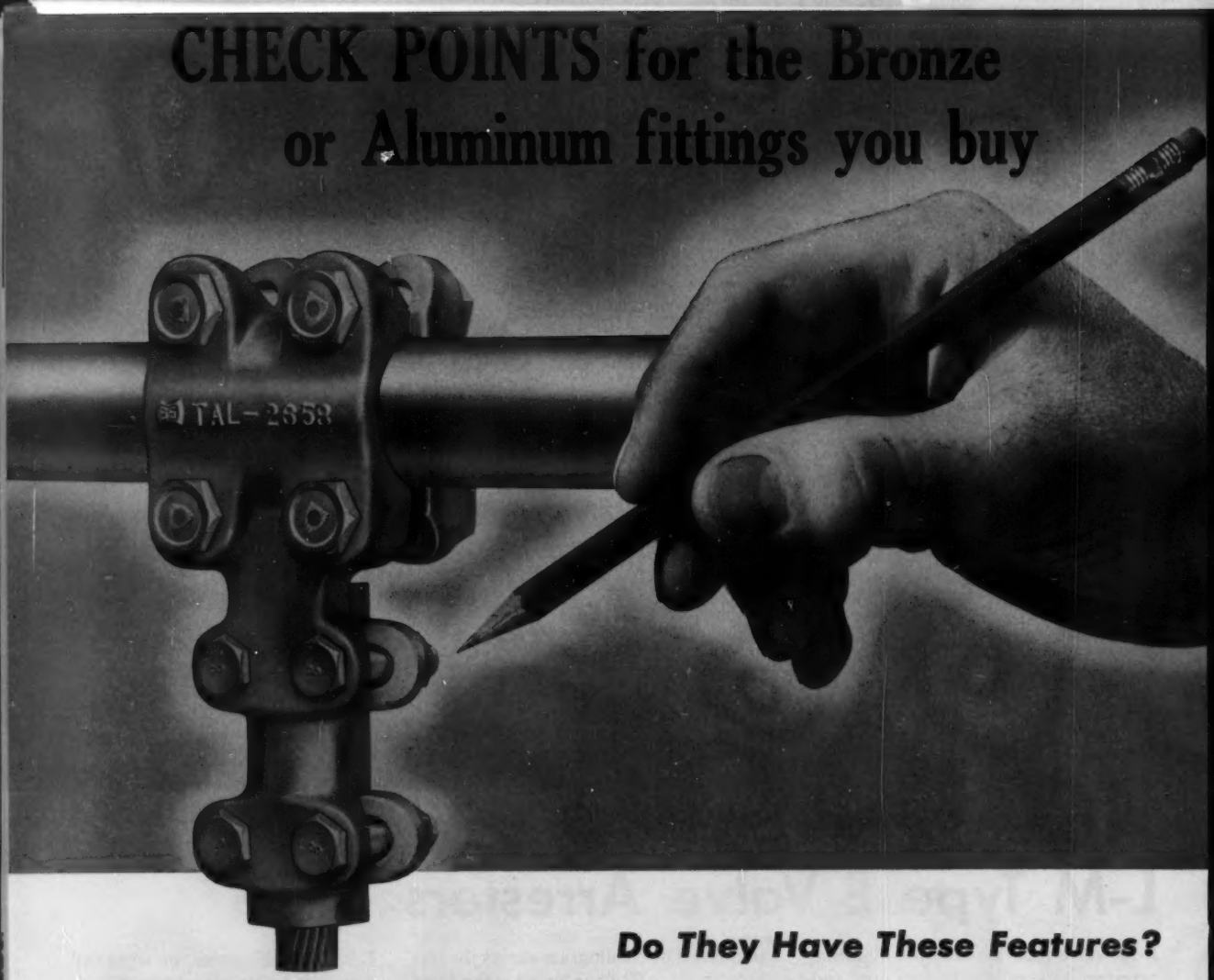
LINE MATERIAL Industries

McGRAW-EDISON COMPANY

LM Lightning Arresters

McGRAW EDISON

CHECK POINTS for the Bronze or Aluminum fittings you buy



Southern States Connectors Meet Every Single Requirement

Never underestimate the importance of a good connection!

A faulty connection can mean trouble and cost you money!

The failure of any connector, no matter how insignificant, can cause a circuit interruption as surely as any major system component. That's why it pays to select the fittings for today's heavily loaded systems with a great deal of care.

Take a look at the check list at right. If you can't answer "yes" to these questions, then the fittings going into your system may be inadequate.

Southern States bronze and aluminum fittings meet every single requirement listed.

For complete information write for catalogs describing Southern States' complete line of bronze and aluminum fittings.

Do They Have These Features?

	YES	NO
Are they structurally strong enough to prevent pull-out of conductors?	☐	☐
Are stress points rugged with cross-sectional strength to spare?	☐	☐
Are bolt heads recessed for single-wrench assembly and disassembly?	☐	☐
Do contact surfaces accurately match curvature of conductor?	☐	☐
Are contact surfaces finished to provide multi-point engagement with conductor?	☐	☐
Are castings fine grained, with smooth pit-free surfaces?	☐	☐
Are contact surfaces extra-large to provide maximum engagement?	☐	☐
Are bolts of standard size and thread for ready replacement from local sources?	☐	☐
Is the over-all appearance of the connector pleasing and not excessively heavy?	☐	☐
Do they meet NEMA standards in every respect?	☐	☐

LIVE BETTER ELECTRICALLY

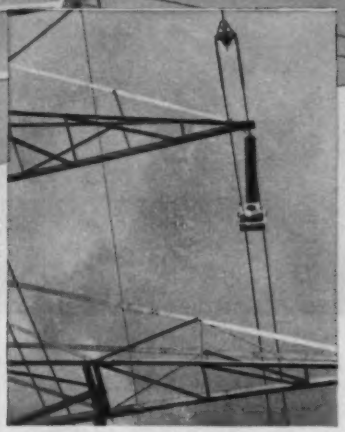
IN CANADA: Dominion Cutout Co., Ltd., Toronto

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

ANOTHER SUCCESSFUL
HOOSIER ENGINEERING *FIRST* . . .

Stringing bundled conductors under tension on a 345 KV line...

Installing spacers



Special spreader and blocks

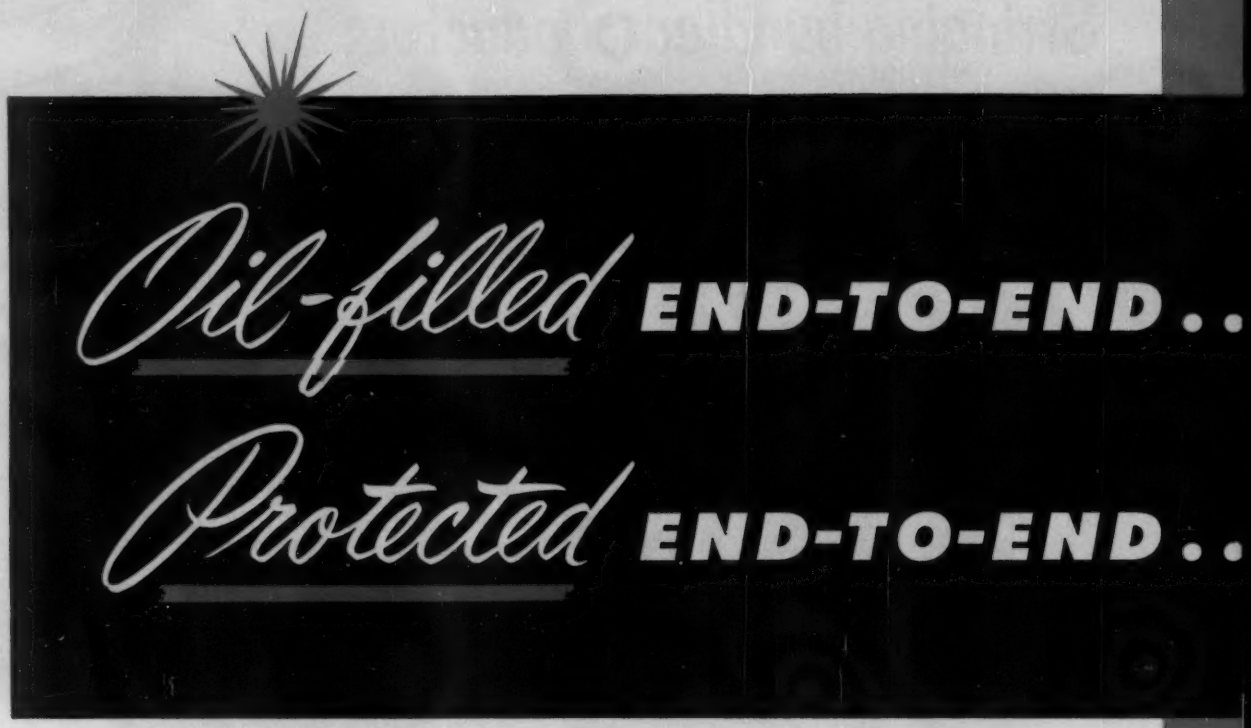
Bundled conductors in place

This recent Ohio installation presented a real challenge. Hoosier met it by developing special equipment and techniques to string, under tension, bundled conductors on a 345 KV line. Never before in power history had bundled conductors been strung under tension . . . but Hoosier did it.

HOOSIER *Engineering Company*

1350 HOLLY AVENUE • COLUMBUS 16, OHIO

ERECTION AND MAINTENANCE OF TRANSMISSION LINES



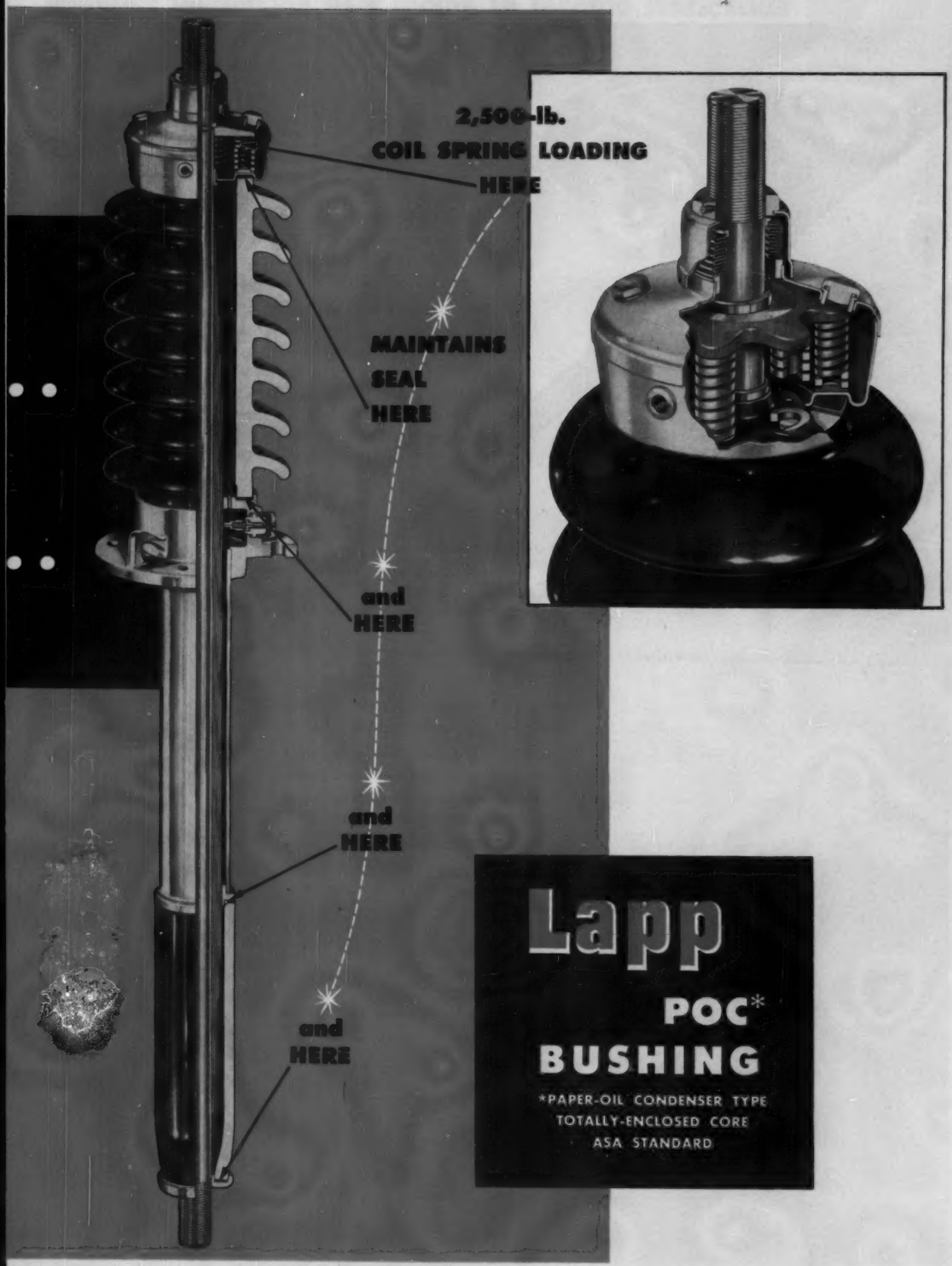
CONDENSER-TYPE • To save equipment size and weight . . . to facilitate interchangeability for replacement in older equipment . . . ASA Standards call for bushings of small diameter. This requirement is met, with wide safety factors in operation, by Lapp POC* Bushings. The internal voltage stresses resulting from these small diameters are distributed by a series of equal-capacitance condensers equally sharing total bushing voltage.

PAPER-OIL INSULATION • For its high dielectric strength, low dielectric loss and proved dependability in service, Kraft paper oil-impregnated is preferred as insulation for highest-voltage applications. That's why paper-oil is used in your highest-voltage cables, potheads and bushings—and why the condenser core of the Lapp POC* Bushing is paper-oil insulated.

ENCLOSED CORE • The housing which encloses the condenser core of the Lapp POC* Bushing is an assembly of metal and porcelain, permanently sealed against temperature change, cantilever or impact stresses. Leakage currents—which can and do result from moisture and contamination in transformer and circuit breaker oil—can flow only over the porcelain shank of the POC* Bushing. This is positive protection to the bushing core, since there's no charring, tracking or deterioration of porcelain from such leakage current. Storage problems of spare bushings are simplified, too, because the porcelain shank of the POC* Bushing needs no protection from natural elements.

Lapp POC* is the bushing design of the future. It's proved and ready to serve you reliably today.

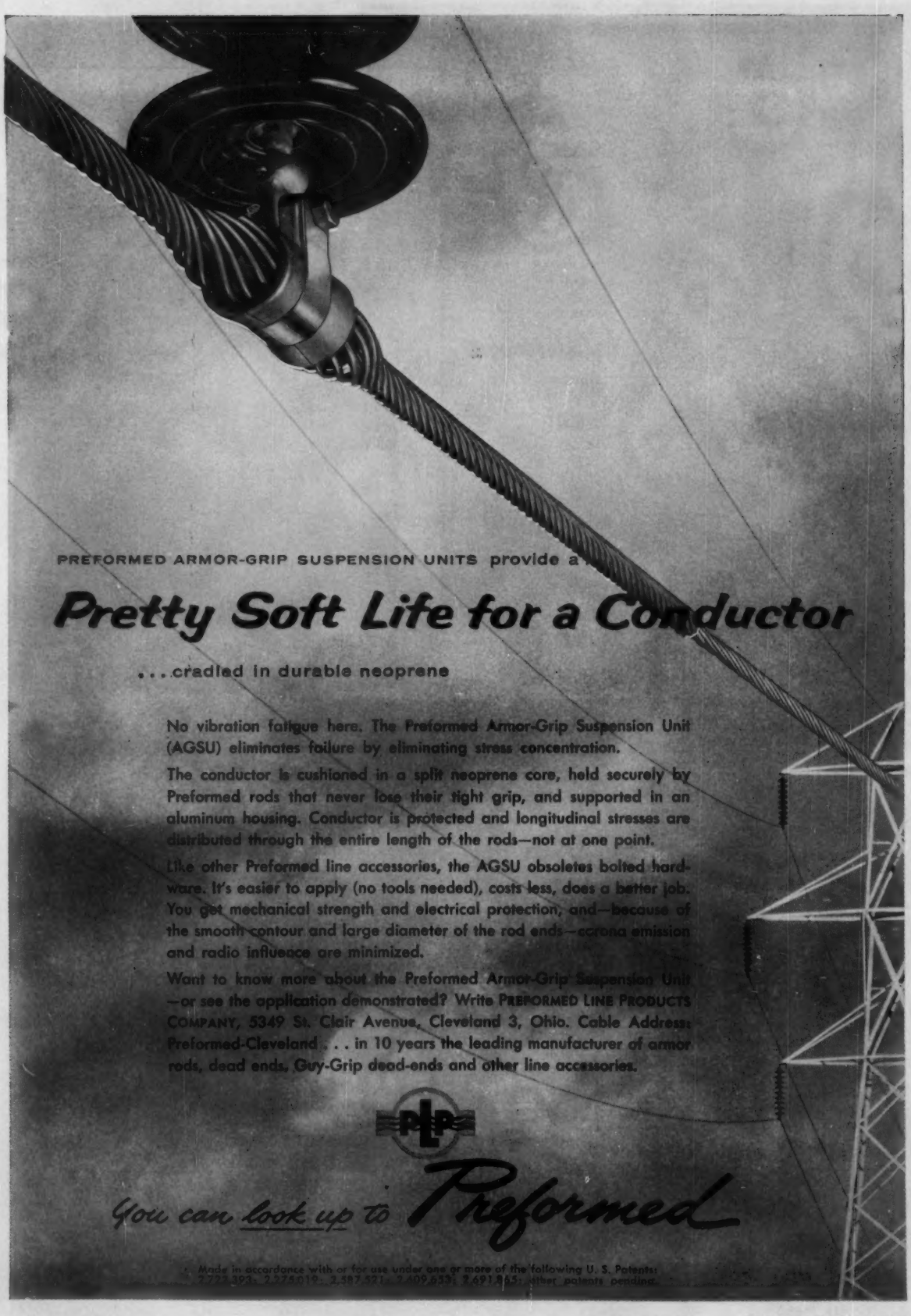
WRITE for specification data. Lapp Insulator Co., Inc., Le Roy, New York.



Lapp

POC* BUSHING

*PAPER-OIL CONDENSER TYPE
TOTALLY-ENCLOSED CORE
ASA STANDARD


PREFORMED ARMOR-GRIP SUSPENSION UNITS provide a
Pretty Soft Life for a Conductor
...cradled in durable neoprene
No vibration fatigue here. The Preformed Armor-Grip Suspension Unit (AGSU) eliminates failure by eliminating stress concentration.
The conductor is cushioned in a split neoprene core, held securely by Preformed rods that never lose their tight grip, and supported in an aluminum housing. Conductor is protected and longitudinal stresses are distributed through the entire length of the rods—not at one point.
Like other Preformed line accessories, the AGSU obsoletes bolted hardware. It's easier to apply (no tools needed), costs less, does a better job. You get mechanical strength and electrical protection, and—because of the smooth contour and large diameter of the rod ends—corona emission and radio influence are minimized.
Want to know more about the Preformed Armor-Grip Suspension Unit—or see the application demonstrated? Write PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead ends, Guy-Grip dead-ends and other line accessories.
PLP
You can look up to Preformed
Made in accordance with or for use under one or more of the following U. S. Patents:
other patents pending.

Midwest institution gets lesson in turbine lubrication

... *learns advantages of using* NONPAREIL *Turbine Oil*

In 1939, a Midwestern institution installed a 350 kw. turbine. In less than a year, considerable difficulty was experienced with oil sludge and deposits. A Standard Oil Company industrial lubrication specialist recommended switching to NONPAREIL Turbine Oil as a solution to the problem. He supervised the draining and cleaning of the turbine system and the installation of NONPAREIL Turbine Oil.

The turbine, equipped with NONPAREIL, was started up in June, 1941. Periodic tests showed that the neutralization number of the oil was never above 0.06 mg. KOH/g. Having had this experience with NONPAREIL Turbine Oil, when a new 750 kw. turbine was installed in 1947, only NONPAREIL was considered. In 1954 when a 1,000 kw. turbine replaced the 350 kw. one installed in 1939, NONPAREIL was again the first choice of the institution management.

The reason why NONPAREIL can deliver this kind of performance is this: NONPAREIL is refined from finest quality oil. An oxidation inhibitor is added to NONPAREIL which checks acidity formation even better than natural inhibitors normally found in oil. The inhibiting of acid formation in NONPAREIL is so complete Standard Oil can guarantee that the neutralization number of NONPAREIL Turbine Oil will never exceed 0.15 mg. KOH/g. for the life of the turbine.

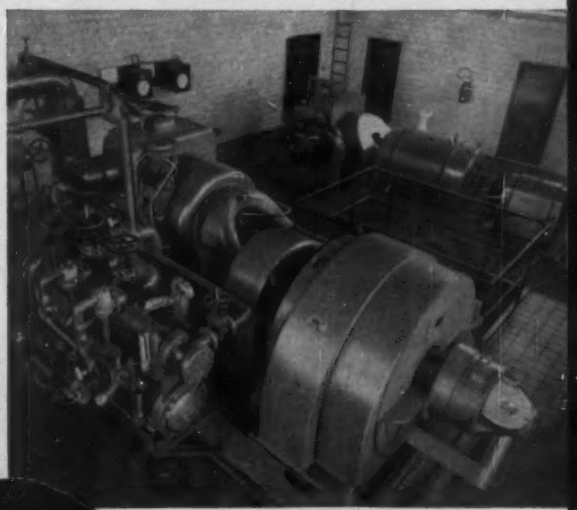
More facts about NONPAREIL Turbine Oil are readily at hand. Get them from your nearby Standard Oil industrial lubrication specialist. There is one of these men in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

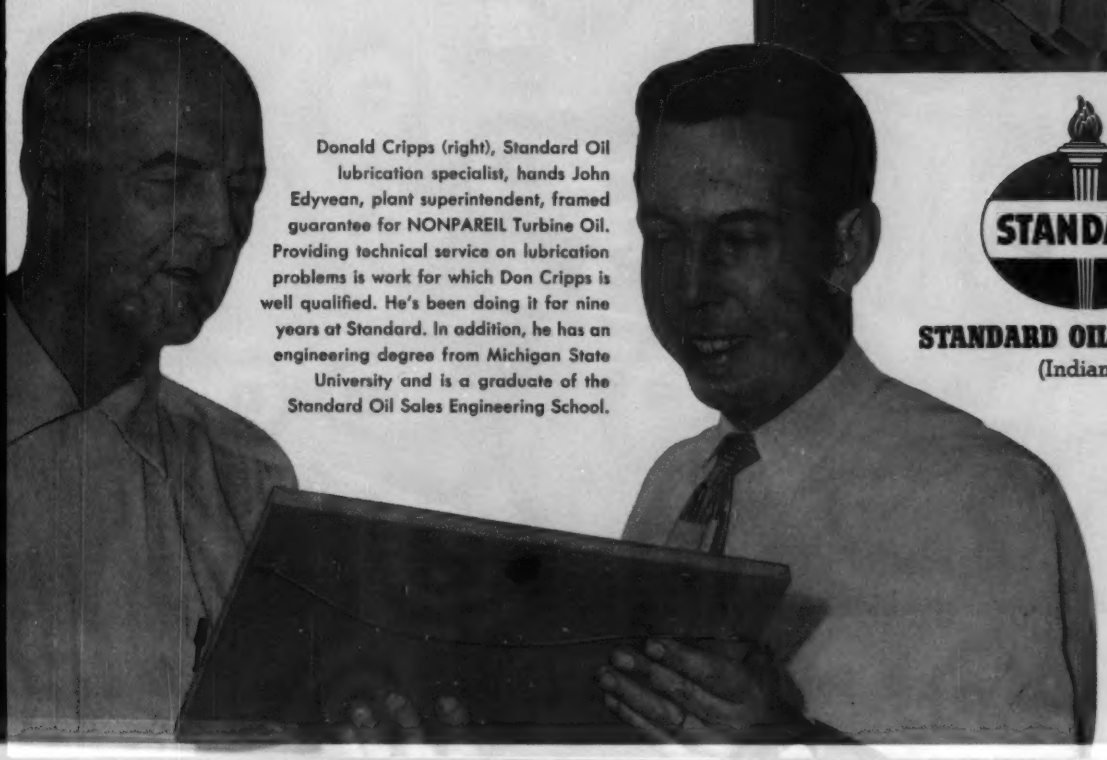
Quick facts about

NONPAREIL TURBINE OIL

- Does not form acids.
- Does not sludge.
- Maintains good demulsibility.
- Guaranteed to last the life of the turbine.

A 1,000 kw. and a 750 kw. turbine provide power to this Midwest institution. Both have used NONPAREIL Turbine Oil since the first day they went into service.





Donald Cripps (right), Standard Oil lubrication specialist, hands John Edyvean, plant superintendent, framed guarantee for NONPAREIL Turbine Oil. Providing technical service on lubrication problems is work for which Don Cripps is well qualified. He's been doing it for nine years at Standard. In addition, he has an engineering degree from Michigan State University and is a graduate of the Standard Oil Sales Engineering School.

STANDARD

STANDARD OIL COMPANY
(Indiana)

"The new Space-Miser is a big forward step in transformer design," says Mr. Howard A. Brown, Superintendent of Electrical Distribution for the Rochester Gas & Electric Corporation. "The new, smooth surfaces eliminate moisture-trapping areas. This reduces corrosion and lowers maintenance costs. When we have to refinish a transformer, the Space-Miser design helps us to do a better job, faster, because all surfaces are easily reached."

"New, streamlined Space-Miser cuts maintenance...

transformer corrosion in network installations reduced, even during city's ice-control program,"

says Rochester Gas & Electric Corporation

Each year, the fight of many cities against winter ice and snow creates big problems for the network. Salt and chemicals, the city's weapons against the hazards of winter, mix with snow and ice to form corrosive slush.

Network transformers—though hidden from sight in subway installations—are highly vulnerable. In addition to normal weather moisture, slush from streets and sidewalks runs into these vaults. Westinghouse Space-Miser network transformers are especially designed to shed corrosive debris and provide many other new advantages.

LESS MAINTENANCE TIME, COST—New, smooth contour tank design with Yukon Coolers eliminates sharp edges and debris- or water-collecting areas. Streamlined design makes cleaning easier, repainting simpler.

PROTECTION AGAINST PARTIAL VAULT FILL-UP—Space-Miser design reduces height 12 inches, allows off-the-floor, I-beam installation to keep transformer out of debris.

LOWER INSTALLATION COSTS—New design reduces weight and volume by 20%, permits faster, easier installation, safer handling.

EASY ACCESS TO HIGH-VOLTAGE TERMINAL CHAMBER—Lowered switch and terminal compartment makes sharp cable bends unnecessary. Extra four-inch width in chamber simplifies forming and connecting high-voltage cable.

For the complete Space-Miser story call your Westinghouse sales engineer . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70613

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Mr. Leon G. Atkinson, Assistant Superintendent, Line Maintenance Department, Rochester Gas & Electric Corporation, supervises installation of new Westinghouse Space-Miser network transformer.

precision...

Power loss is practically eliminated with Anderson's Suspension Clamps. They are precision engineered to permit dual use . . . suspension as well as angle pull off. Specific features were engineered to allow widest range of conductor sags. Light weight construction reduces conductor damage.

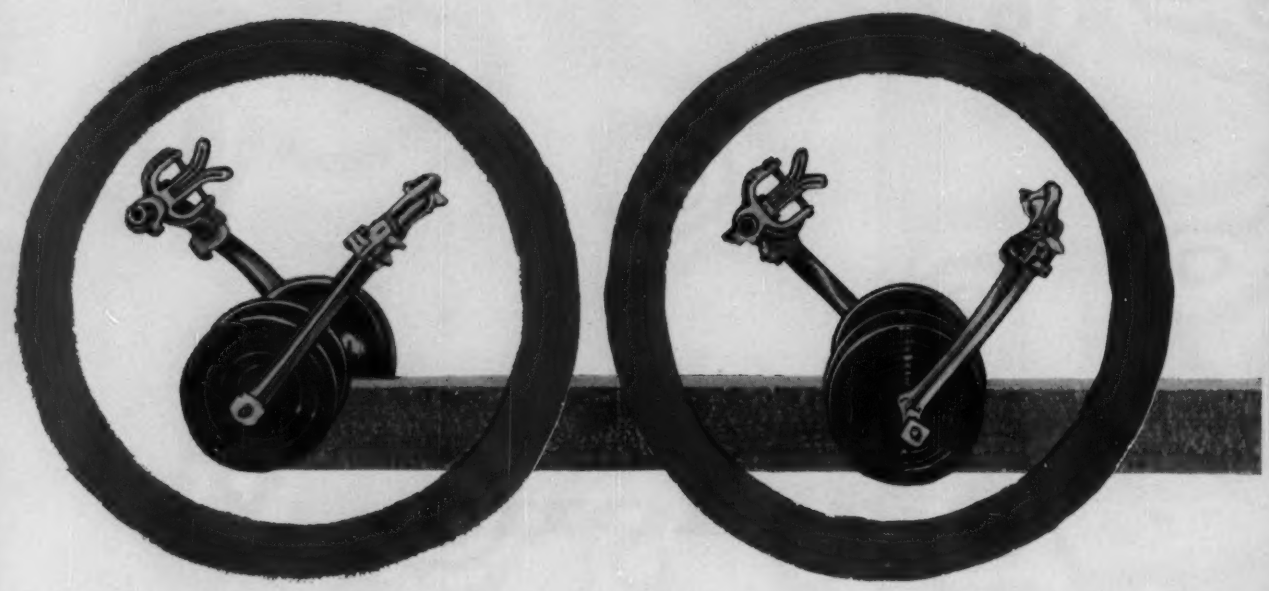
ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

ANDERSON ELECTRIC

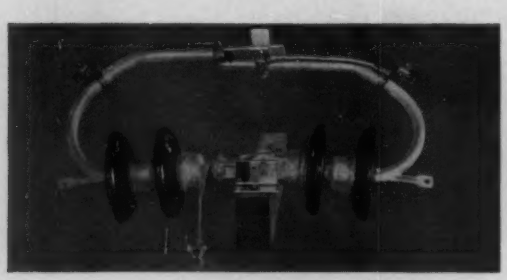
*Sold through Insulator Manufacturers.
Export Agent: International Standard Electric Corp.

uminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATIONS • TRANSMISSION • DISTRIBUTION

This "look" on a pole



The original "straight-through" airbreak switch—proven in 50 years of system service



There's no mistaking the exclusive, clean, functional appearance of KPF switches. Their pleasing appearance derives from their simple design—simple design that assures you operating ease in all weather. There are no complicated mechanisms to malfunction, freeze, lock, need lubrication or wear out.

For 50 years, KPF switches have proved their trouble-free service advantages to major power companies. Why not make a test installation on your own lines; see for yourself. More and more companies are. Why not do it this month?

Write direct for catalog.

means KPF

Some practical reasons for buying KPF Switches

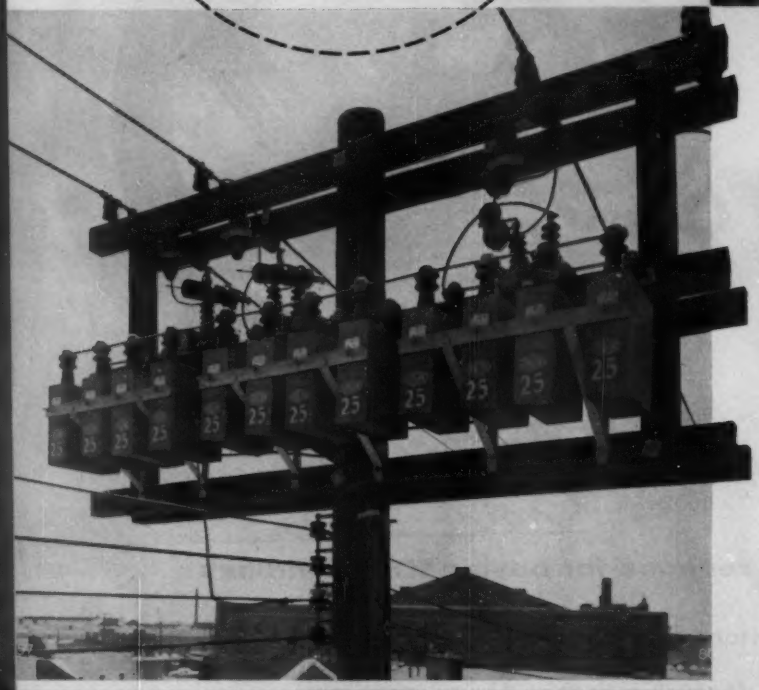
- simplest switches made; trouble-free
- simple manufacturing means lower cost
- no extra dead-end insulators
- installation time half normally needed
- easily installed on hot lines
- install in the air or on the ground
- needs no servicing, year after year

KPF
AIR BREAK SWITCHES
Standard for nearly half a century

KPF ELECTRIC COMPANY
Dept. E. 1624 E. Alpine Avenue
Stockton 5, California

Sangamo
Capacitors
"APPROVED"
by more and more
major utilities!

Dielectric packs are wound of special kraft paper and pure aluminum foil. Atmospheric conditions are controlled to eliminate any danger of contamination.



Constant care in longer service

Sangamo Power Capacitors are built to rigid specifications to meet power engineers' requirements for stable performance and long service life.

Rigid quality control of raw materials . . . constant care in every step of manufacturing . . . thorough testing and inspection . . . are all part of these specifications.

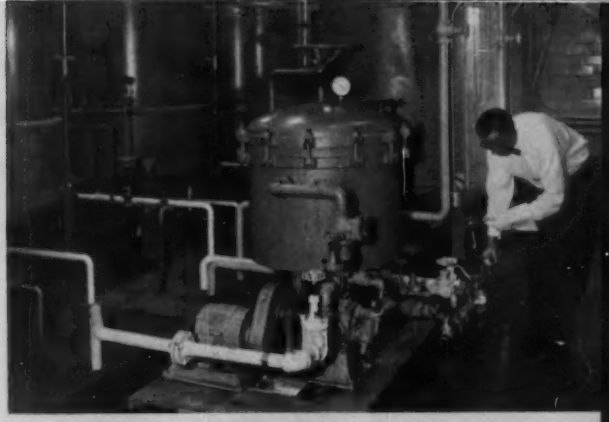
These capacitors are built in one of the country's most modern "controlled conditions" manufacturing plants. Dust is filtered out of the atmosphere to eliminate danger of contamination. Temperature and humidity are controlled to assure product uniformity.

The power engineers of many major utilities have inspected Sangamo's processing facilities, some of which are shown on these pages, and

This bank of 25 Kvar Sangamo Capacitors is controlled by the voltage type Sangamo VC Lincolntrol shown below. The service is 2400/4160 Y grounded neutral with capacitor cases and Lincolntrol tied in with ground.

Specific tests precede and follow almost every processing operation. Here dry rolls are being measured for capacitance and power factor.

Sangamo Diaclor, the liquid dielectric used in these capacitors, is purified here. Great care is taken to maintain its purity.



Sangamo's facilities are geared for quantity production. Here is one of the capacitor vacuum impregnating tanks.

production means on your lines

have put Sangamo Capacitors on the "Approved List" of their respective companies. Sangamo Power Capacitors are available in 15, 25 and 50 Kvar units, in all primary voltage ratings, and in factory-assembled and wired Auto Var equipments for pole-type installation.

Sangamo also manufactures Lincolntrols and Time Switches for automatic capacitor control as a function of time, volts, amperes, watts, or vars—or as combinations of these functions. Look to Sangamo for all your capacitor requirements ... visit our plants ... inspect our facilities. Ask your Sangamo Representative, or write us for complete information.

Each unit is tested for overvoltage, capacitance, power factor, and radio noise in a completely shielded test booth. Capacitance and power factor measurements are made at rated voltage and frequency with a high-precision bridge.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

After final inspection and tests, the completed capacitors come off the assembly lines and are packaged for shipment to you.

PG&E towers rise in California's San Joaquin Valley

Eighty-two 220-kv double-circuit towers deliver power to serve increasing load SW of Fresno farm and industrial center

One of the fastest growing areas in the country's fastest growing state is California's San Joaquin Valley. Hub of the area is Fresno, once a quiet farm community, but now a bustling metropolis.

Expanding industries and a growing population aren't the only reasons for the increasing demand for power in this area. In these parts farming is done on a highly industrialized basis. Irrigation is vital. And much of the irrigation calls for powerful pumps that pull water from deep underground. Lots of electric power is needed to keep these pumps working 24 hours a day.

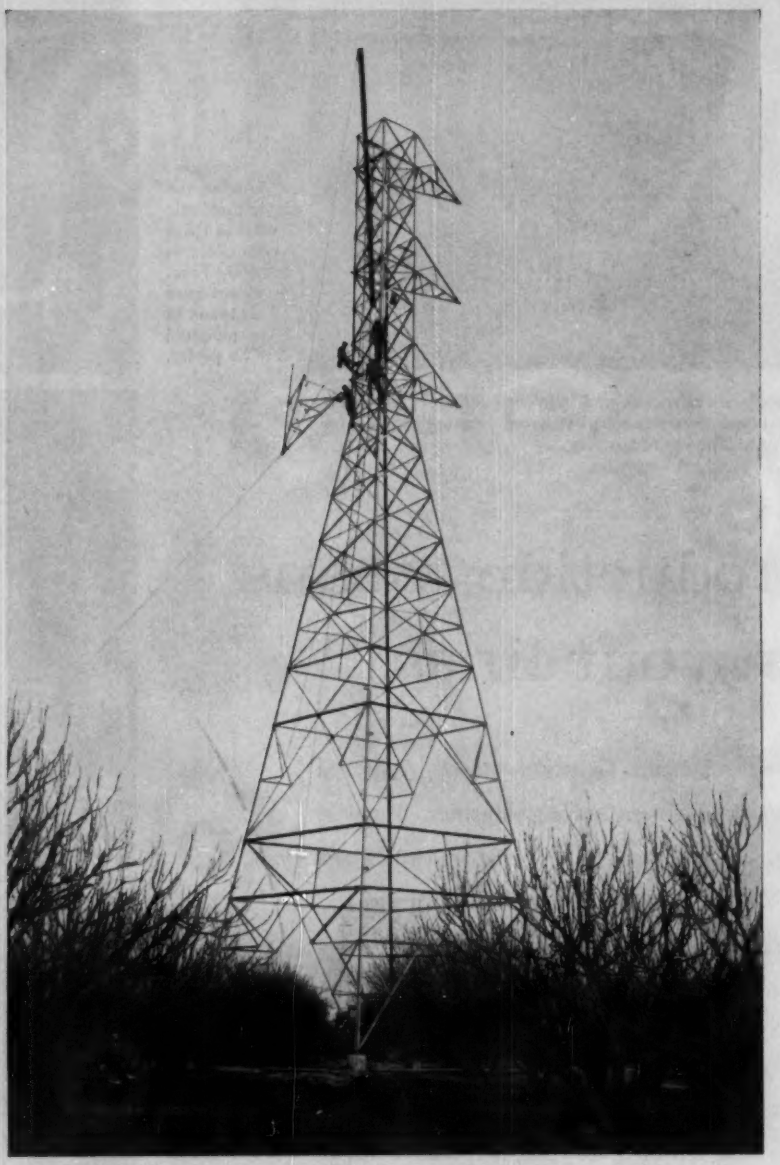
17.8-MI LINE . . . To better serve these power needs, Pacific Gas & Electric Co. recently completed a double-circuit 220-kv line. It begins at a substation on the San Joaquin River at Herndon and heads nearly due south for 17.8 mi. It terminates at Raisin City Junction where it meets the Panoche-McCall 220-kv line, another PG&E project.

82 STEEL TOWERS . . . PG&E selected Bethlehem galvanized steel towers for the job. It required 82 towers totalling 694 tons of steel. Most of the towers are 125 ft high and weigh 8½ tons, complete with foundation stubs. Average span length is 1100 ft.

The conductors are 1,113,000 cm all-aluminum, sixty-one strands. There are no static wires as outages due to lightning are infrequent in this section of California.

FABRICATED BY BETHLEHEM . . . The towers were detailed, fabricated and galvanized in accordance with PG&E Co. designs at our South San Francisco tower shop. West Coast requirements for towers and switching structures are also fabricated at our Seattle shop. Our East Coast tower shop is located at Leetsdale, Pa., near Pittsburgh.

If you would like to have more information about transmission towers fabricated by Bethlehem, kindly contact the sales office nearest you.



Budding fig trees set the scene as a PG&E tower erection crew prepares to bolt an arm into place. This tangent tower is 130 ft tall and will carry two 220-kv circuits.

The new line begins at the Herndon Substation on the San Joaquin River and heads nearly due south, passing just west of Fresno, and terminating at Raisin City Junction.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

The story of drastic size reduction is really a story of big savings in installed cost.

See the next page and get the facts on this important feature of new Thorex Dynagap lightning arresters.

Size comparison between Thorex Dynagap arrester and a switch insulator stack at 230-kv operating voltage. Consider the advantages in construction ease, arrester placement, and installed cost, resulting from the compact design of new Thorex Dynagap station class type MPR lightning arresters.

SAVE THEIR PRICE...

Compact new THOREX® Dynagap Arresters...No Bigger than an Insulator Stack... Requiring No Auxiliary Support...Handled in One Piece...Change All Past Ideas of Construction Costs.

What have you paid for high voltage lightning arresters — design, fabrication, and erection of special supporting steelwork — man-hours for arrester construction? All these items are properly added to the purchase price of the arrester itself, that is sometimes almost "lost" in the estimate!

Now you can show a clean saving well up in four figures. And for this you will get an arrester with remarkably improved protective qualities — the Thorex Dynagap.

These arresters are no bigger than an equivalent switch insulator stack. They are shipped and handled in one piece. They require absolutely no auxiliary bracing or support at any voltage. The simplest concrete base or latticework pedestal is the only item of installation. They will fit into station steelwork almost as easily as a stack of insulators. Add up the installed cost of conventional high voltage arresters, and you will then appreciate what these economies really mean.

Size of new Thorex Dynagap lightning arresters has been reduced so drastically that it can become routine to tank-mount arresters from 115 all the way to 230 and 345 kv. Even brackets could be eliminated, since height of the arrester practically matches that of the bushing terminal above the apparatus cover.

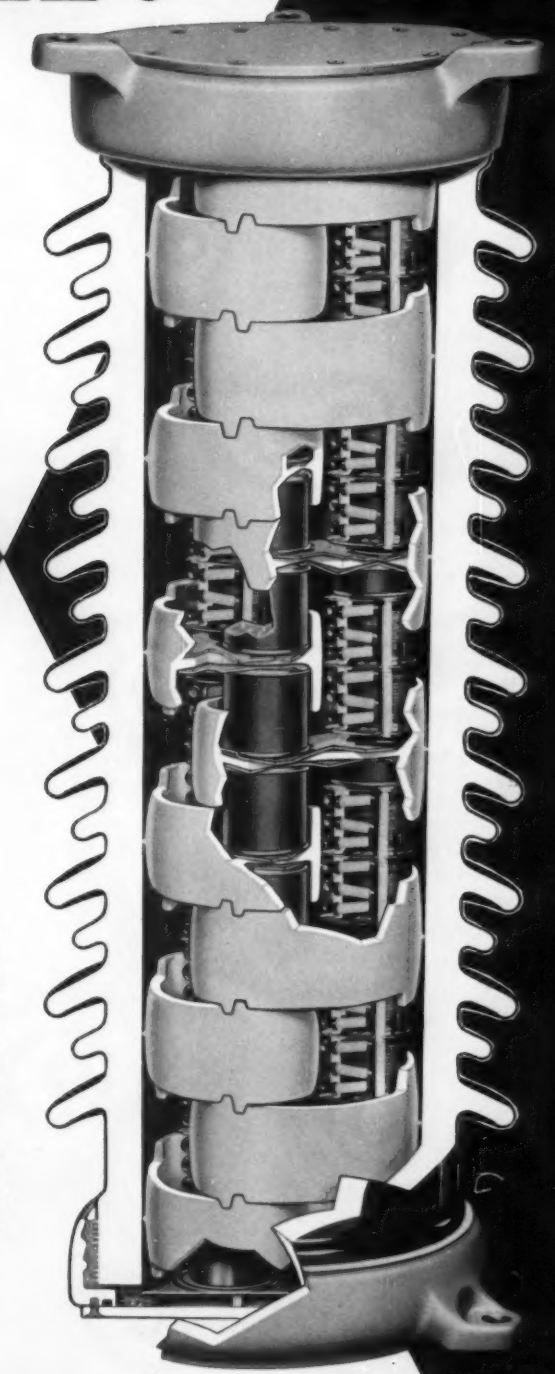
Economy and convenience, while important, are matched by many other equally valuable features of the new station class Thorex Dynagap, such as complete freedom from internal damage due to severe contamination, and unheard-of levels of surge current durability.

For an entirely fresh conception of lightning arrester protection, *added to substantial money-saving*, install new Thorex Dynagap type MPR lightning arresters at your major station locations.

OHIO BRASS COMPANY • MANSFIELD, OHIO

Ohio Brass

..OR MORE!

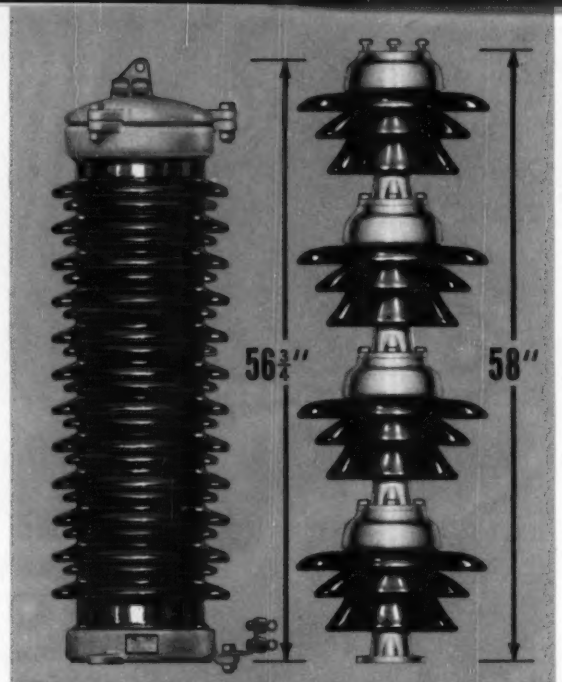


Size reductions accomplished in the new Thorex Dynagap station class type MPR lightning arrester are the result of remarkably compact and efficient new internal elements. This gap structure, for example, has a rating of 9 kv and a total follow current interrupting gap length of 66 inches, all in physical dimensions of approximately 3 x 5 inches. These miniaturized elements permit triple-column stacking within the 16½-inch porcelain housing, thus effecting a height reduction down to one-third that of conventional end-to-end assembly of internal parts. This compact construction is shown in the cut-away view of a typical MPR Thorex model.

JUDGE FOR YOURSELF

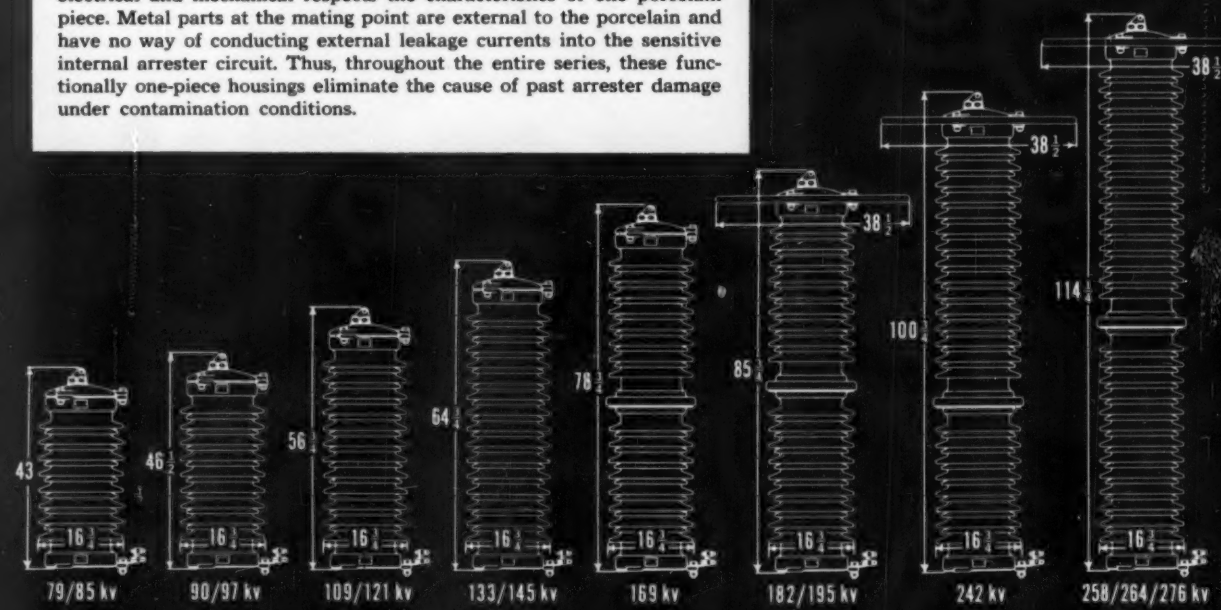
what these reduced dimensions of Thorex Dynagap station class arresters can mean in construction simplicity and radical cost-savings.

Ohio Brass
MANSFIELD OHIO, U.S.A.



Striking height comparison between a NEMA Standard station insulator stack and Thorex Dynagap type MPR lightning arrester, rated 121 kv line-to-ground (138-kv service voltage). Note that height as well as diameter almost coincide and permit location of the arrester at any point in a station structure that will accommodate conventional insulation.

Thorex Dynagap station class high voltage lightning arresters, type MPR, are available in the indicated line-to-ground voltage ratings. It will be noted that more than one rating may have the same external dimensions. Compare these ratings and dimensions with your own data on NEMA Standard station insulator stacks. Above 161 kv, housings consist of two porcelain parts, permanently bonded, and having in all electrical and mechanical respects the characteristics of one porcelain piece. Metal parts at the mating point are external to the porcelain and have no way of conducting external leakage currents into the sensitive internal arrester circuit. Thus, throughout the entire series, these functionally one-piece housings eliminate the cause of past arrester damage under contamination conditions.



EDITORIALS

Corrosion Research—A Prudent Investment

Ignorance costs money! This is particularly true today in the field of corrosion. Though much is being done to combat and control it, the fundamental understanding of corrosion phenomena is fragmentary. This inadequacy of present knowledge is costing American industry $5½ billion a year in direct replacement costs alone. The electrical industry generally, as well as individual electric utilities bear part of this annual expense and have a stake in its elimination.

Coordinated corrosion research is the solution. Up till now the approach to corrosion control has been mostly by empirical methods. While a few investigators have studied isolated aspects of the problem, and their findings have been worth while, there has been a lack of coordination among related studies.

To get the most out of corrosion research programs two things are needed:

- Increased fundamental scientific data.
- A concerted and coordinated team effort by scientists in the several fields of learning that bear on corrosion.

It was to meet these needs that the Corrosion Research Council was organized by the Engineering Foundation in 1955 and sponsored by over 35 technical societies and organizations interested in corrosion.

Working with a limited budget the Council has made a notable start in its first two years. A project to study corrosion relations at the surface of metals is in its second year and the Council is supporting another on the stress corrosion cracking of metals.

Organizations with the scope and backing of the Corrosion Research Council provide the best medium through which the modest contributions of individual companies can be pooled to achieve a big-enough effort for the required progress. Yet the fact remains that the Engineering Foundation has only been modestly successful in getting financial support from industry for corrosion research.

With so much at stake and so much to be gained on electrical systems from reduction of expenditures for corrosion control, management should give thoughtful consideration to the support of foundamental, coordinated research in this field.

Continued ignorance will cost more than sustained support.

The Third Man Is The Key Man

If you haven't already guessed from our cover this week, The Third Man in HOUSEPOWER is that key man—the electrical contractor. He is the link between the other two—the utility and the customer.

Because of his key position in the HOUSEPOWER scheme of things, the contractor's importance can't be overemphasized. He is the man on whom success of the entire program depends. For this reason utilities must not only continue to offer him educational and promotional support and assistance; they have an obligation to augment such assistance in ways that will show him how to participate in HOUSEPOWER and make a profit too.

Utilities are aware of this. Largely because of it they have increased their advertising and promotion expenditures steadily in the two years HOUSEPOWER has been a member of the electrical industry family. But such increased expenditures are only part of the story. Utility dealings and relations with the electrical contractor vary greatly. There are many important areas where the contractor is not getting the support and guidance he requires from his local utility.

Lying at the root of the matter is the contractor's rather widely held conviction that he cannot make money on house rewiring. This is a mistaken idea. He can, but the electric utilities will have to help him.

Electric utilities must direct their advertising and promotion to sell customers on the wisdom of planned rewiring—not merely rewiring, but rewiring done adequately and properly by competent contractors. They must convince the customer that the cheapest job is not the best, but may well be the most costly. The utility must help condition the customer to look out for qualities such as workmanship and contractor reputation.

Thus by precept and example the utilities can teach contractors to follow the pathway to profits in a practical way—by selling the job "up". In this way, too, the contractor will learn to remind the customer of the things he has read in his newspaper or heard on his radio: that proper wiring is as important to his home as good roofing or adequate insurance.

And it can be done!

When it is done—and only then—will we get more contractor participation in HOUSEPOWER.

GENERAL PRESTON: His men will live better electrically

SENATOR CAPEHART: He turned the first shovel of dirt

Electricity Wins Victory in Arkansas

Heat pump wins all rounds as Congress endorses all-electric Capehart Housing Development for Little Rock Air Force Base

Electricity has won a resounding victory over gas in the highly competitive field of home heating and cooling. The battle began in the red clay of an Arkansas field, and ended early this month on the polished floor of a Congressional committee-room.

At issue was service of a $21 million Capehart Housing project at Little Rock Air Force Base (EW, Apr. 8, 1957, p. 108). After a hearing held at the request of the gas company, the House Subcommittee on Appropriations upheld an Air Force contract calling for installation of 1,535 heat pumps and an all-electric development.

The Little Rock AFB project is reported to be the first military heat pump housing project in the world. It is also said to be the first all-electric project approved by the U. S. Air Force and the Department of Defense.

Each of the 1,535 housing units to be constructed will be all-electric. In addition to a 2½-ton heat pump, each home will have an all-electric kitchen with range, refrigerator, dishwasher, garbage disposer, and connections for washer and dryer, and a 40-gal quick-recovery water heater.

Arkansas Power & Light Co was able to win this award from its gas competitor on the basis of cost alone.

Gas Is Traditional

When the project was first contemplated, AP&L Vice President W. M. Shepherd decided to try to sell the Air Force on the heat pump and on the advantages of all-electric living for its people. But selling the heat pump in Arkansas was no mean task. The state ranks ninth in the U. S. in production of petroleum and natural gas, and traditionally homes are either gas or liquid-petroleum heated.

Arkansas P&L prepared plans which were approved by the project's architects and by the Federal Housing Administration, and then submitted them with an estimate of cost to Headquarters, Strategic Air Command, Omaha, Neb., where the decision had to be made.

Air Force officials received the estimate from AP&L. Meanwhile, Arkansas Louisiana Gas Co submitted a plan for gas heating, cooking, and water heating, and an electric central air conditioner.

The Air Force made detailed studies of the two plans and their attached estimates, and decided they favored heat pumps. But to insure that their studies were valid, they sent the whole package up to a disinterested engineering firm in New York for more checking.

The New York firm agreed with the Air Force's preliminary evaluation, also favoring the heat pumps.

Upon receipt of this confirmation of their own studies, the Air Force let the contract, and expected no more controversy.

Arkansas Louisiana Gas, however, was voluble in its protest. Unwilling to believe they had been beaten on a strict cost basis, the

HEAT PUMPS will go into 1,535 of these Capehart houses at Little Rock Air Force Base—in the heart of gas country

company petitioned for a hearing before the House of Representatives Subcommittee on Appropriations. The claim was, and the gas company's figures showed, that any saving realized from initial installation of all-electric equipment would be far outweighed by the lower operating costs of a system using gas.

The Subcommittee studied this, then held a hearing.

At the hearing, Assistant Secretary Floyd S. Bryant represented the Department of Defense. The Air Force was represented by Brig Gen J. E. Gill, who had conducted the investigation that led up to the award of the contract. Army and Navy officials also were present.

General Gill testified that he had awarded the contract based on the lowest bid and his own substantiated engineering studies. He said that without considering comfort, safety, or any "bonus" money savings such as lower redecoration, cleaning, maintenance, or depreciation costs, he was convinced that the overall cost of electric heating and cooling would be lower than a combination of electricity and gas.

General Gill pointed out a few discrepancies in the gas company's figures. "For example," he said, "the 65 million Btu heat-loss figure used by Arkansas Louisiana Gas Co is approximately 70% greater than the Air Force's highest calculations for all-electric service. This throws an element of doubt into all figures utilized since the company has, in fact, a vested interest in reflecting a high annual heat loss."

Gas Miscalculates

"As another example," the general continued, "the gas company failed completely to calculate the required power to operate the blower fans on the gas furnaces. Further, the Arkansas Louisiana Gas Co states that an annual saving in operating expense will be reflected by using the gas-electric combination of $310,322. The Air Force's total estimated annual operating cost is only $224,091 for all-electric service. It is believed impracticable to save more than the total cost."

Another fact that bludgeoned the gas company's case concerned rate increases. Although the Arkansas Louisiana Gas Co could produce figures showing that lower operating costs with gas-electric would make up for the saving in initial installation realized with all-electric, the subcommittee was impressed by the fact that gas rates in that area had risen better than 100% in the past 8 years, while electric rates had risen only 3.4% over the past 13 years. "It is not conceivable that this trend would reverse itself within the next 20 years," said Gill.

He concluded that a careful comparison of the choices: all-electric with heat pumps, or gas-electric, showed heat pumps the winner dollar for dollar without even considering their advantages in comfort and convenience.

The hearing adjourned with the Subcommittee satisfied that the Air Force should be allowed to hold to its heat-pump decision. The contract is being executed as awarded.

Shepherd summed up like this: "This project will be a laboratory for all-electric living. It will also prove valuable in promoting the sale of heat pumps, not only in Arkansas, but throughout the Middle South and Southwest areas."

Electricity's victory over gas in its own back yard has established the heat pump in the first Air Force Capehart Housing project. And $639 million will go into similar projects, some of which may use heat pumps.

And the fact that the victory was won strictly on a dollars and cents basis could lift the heat pump out of the luxury category and into a prominent place among practical home heating and cooling units.

Partnership Keynotes 85th's Box Score

Bill	What It Does	Senate	House	Public Law
Niagara	Authorizes N Y State Power Authority to undertake $600-million redevelopment of Niagara.	Passed	Passed	Signed by President
Tax Amortization	Restricts issuance of new tax amortization certificates to new or specialized facilities for military or atomic needs.	Passed	Passed	Awaiting President's Signature
Hells Canyon	Authorizes Federal construction of high dam at Hells Canyon on Snake.	Passed	Killed	———
Fryingpan Arkansas	Authorizes federal construction of giant reclamation-power project.	Passed	In com	———
Trinity River	Authorizes partnership development between Interior Dept. and Pacific Gas & Electric for development of power facilities at Trinity River.	———	In com	———
TVA Financing	Authorizes TVA to sell $750 million of bonds to finance power expansion.	Passed	Awaiting action	———
AEC Authorization	Authorizes civilian power reactor projects for which funds may be sought.	Passed	Passed	Awaiting President's Signature
AEC Liability Insurance	Authorizes up to $500 million federal liability insurance for licensed nuclear projects.	Passed	Passed	Awaiting President's Signature
Utility Highway Relocation	Bars federal highway money to states which reimburse utilities.	In com	In com	———
REA Interest Rates	Three bills provide for increasing interest rates on electrification loans.	All in com	All in com	———
Omnibus Rivers and Harbors, Flood Control	Contains about 100 new projects, including a number of multiple purpose projects. This bill was vetoed in 1956.	Passed	Awaiting action	———
Public Works Appropriations	Bill includes $1 million to start construction of John Day Dam on Columbia River and a prohibition against Bureau of Reclamation using funds for Pleasant Valley study.	Passed	Passed	Awaiting President's Signature
Holding Co Act Amendment	Would exempt utilities from the holding co act when they engage jointly in building large hydro, atomic, or coal plants	In com	———	———

Ike's power policies emerge almost intact except for the AEC authorization bill

When the eighty-fifth session of Congress opened at the beginning of the year the Democratic majority was promising to ride the Eisenhower power policies into the ground.

But at this stage of the game this has proved to be far from reality. Actually, it's more accurate to say the Administration power policies emerged almost unscarred.

Look back to the beginning of 1957. Wayne Morse had won a sound victory in Oregon over former Interior Secretary Douglas McKay and was attributing this to the unpopularity of the Administration's partnership concept.

The same thing was being said of the defeat in Washington of Gov Arthur B. Langlie by Warren Magnusen. Other contests in the West in which Democrats triumphed were also being labeled as victories for the anti-Eisenhower power policy forces.

Assault That Didn't Come

All this, on paper at least, added up to all-out assault by Democrats.

Morse, for instance, regarded his victory as a mandate to renew a push for a federal high Hells Canyon dam. True, the bill passed in the Senate. But it died in the House. Its chances for revival next year are not good.

Hells Canyon has for years been the symbol of the aspirations of federal power supporters. Its defeat in Congress is more than just the defeat of a piece of legislation. It's a fundamental victory for the Eisenhower concept.

Niagara, another symbolic issue, also reflects the spirit of moderation. A year ago federal power die-hards would not have considered approving a bill which in effect weakens the preference clause. But such a bill is now law.

The session has not been all

moderation and mildness. Sen Estes Kefauver tried to strengthen the case for the federal Hells Canyon bill by holding a critical hearing on rapid tax amortization certificates issued to Idaho Power Co.

Kefauver claims the hearing was responsible for swinging a number of Senate votes in favor of the bill. Yet, in the final analysis, his efforts were fruitless.

House Ignored TVA Bill

Federal power forces again demonstrated lack of strength in the matter of TVA bond financing. A bill was passed by the Senate but it contained a number of weakening amendments and compromises. Even so it still proved unacceptable in the House, where it was not even brought up for consideration.

Throughout the session the House has overwhelmingly opposed anything smacking of federal power. This has not been true of the Senate.

Democratic efforts to gain a program of federal power reactor construction were soundly defeated in the House but the Senate reversed this decision. This issue was thrashed out in conference last week, then passed by both houses.

Prior to the conference on atomic power plant authorizing legislation, the House turned down a Democratic-sponsored $58-million program of federal reactor construction. The Senate restored it. The conferees left the program substantially intact but whittled it down to $21 million.

AEC's Scope Broadened

The compromise bill, which is approved by Senate and House, calls for AEC to:

- Undertake development and design studies on a natural uranium, gas-cooled reactor. Conferees allowed $3 million for this project compared with $40 million voted by the Senate.
- Construct a $15-million plutonium recycle reactor to develop use of plutonium as an atomic fuel.
- Take over direct construction of the power reactors proposed by co-op and municipal groups in Piqua, Ohio, Elk River, Minn., Wolverine, Mich., and Chugach, Alaska. Conferees knocked out of this a requirement for a fifth project to be built by Consumers Public Power District, Nebraska.
- Trimmed from $4.2 million to $1.5 million the authorization for funds for research and development on the Power Reactor Development Co fast breeder reactor. Conferees changed the language in this clause to permit the $1.5 million to go for work on the PRDC project. The Senate had restricted the $1.5 million to fast breeder work in general and not specifically PRDC.

What it all adds up to is this: The partnership concept is still very much alive. There is no indication that, with an election year coming up, there is any tendency of the Administration and Republicans to back away from their original power policies.

Congress OK's Atom Insurance

Federal program would charge $30 a year per 1,000 kw of rated capacity. Suppliers and installers to be protected

The civilian atomic industry achieved a cherished goal this week: A federal insurance program that will pay up to $500 million in damage claims arising from any reactor accidents.

No Claims Anticipated

Sen Clinton P. Anderson (D-N. M.), who steered the House-passed bill to Senate passage without opposition, says foremost experts on the subject are confident the government will never have to pay a claim under the legislation. But the Atomic Energy Commission and private firms now building or planning reactors say comprehensive insurance is essential before they can operate.

The bill, expected to get Presidential signature without quibble, requires reactor operators—in order to be eligible for government insurance—to first purchase maximum coverage (about $60 million per accident) that private carriers will write.

A major point in both private and government programs will afford financial protection against damage claims to contractors and subcontractors on reactor projects, as well as the owner-operator. Thus a supplier or installer, whose contribution might ultimately be held to have caused an accident, will be shielded from damage settlements.

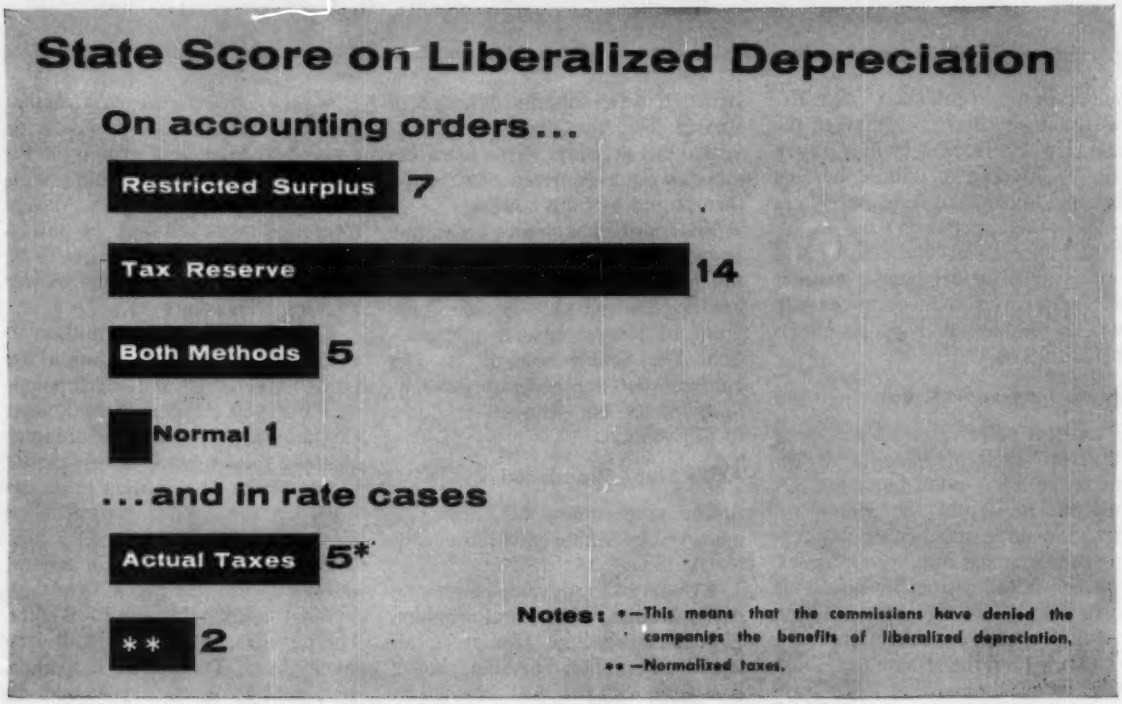
Private Coverage Is Costly

Available private insurance is going to be expensive. Anderson says, for example, that a $50 million policy on Consolidated Edison Co's 630,000-kw New York project will carry a $250,000 annual premium. To participate in federal indemnification—and run its coverage to $500 million—Consolidated Edison will need pay only another $18,900, in administrative cost fees, to AEC.

AEC's fee charges for commercial facilities are $30 per year per thousand kw of thermal energy. Anderson says the administrative fees are just that, and are not intended to build up an actuarially sound reserve.

He mentioned other projects and their annual private insurance and AEC fee payments:

- Yankee Atomic Electric Co—480,000 kw, $130,000 annual premium, $14,400 annual administrative fee.
- Elk River Cooperative, 58,000 kw, $69,430 premium, $1,640 fee.
- General Electric Co's pilot plant at Vallecitos, Cal., 12,000 kw, $67,000 premium, $360 fee.
- Armour Research Foundation, research reactor of 50 kw, $59,000 premium, $100 fee.
- Battelle Memorial Institute, 1,000 kw, $50,500 premium, $100 fee.


State Score on Liberalized Depreciation
On accounting orders...
Restricted Surplus 7
Tax Reserve 14
Both Methods 5
Normal 1
...and in rate cases
Actual Taxes 5*
** 2
Notes: *—This means that the commissions have denied the companies the benefits of liberalized depreciation.
**—Normalized taxes.

What Next for Liberalized Depreciation?

Next month's FPC hearing will explore three methods—normalized income, vintage-year, and new reserve account—in search for a uniform approach. Here are some pros and cons

Today, handling of liberalized depreciation in financial statements is uppermost in minds of electric utility executives dealing with finance. They wonder how it should be handled and how it will affect rate structures.

For the answers, they are keeping a close eye on the Sept. 17 Federal Power Commission hearing on liberalized depreciation and accelerated amortization. This hearing could greatly influence the thinking of state public service commissioners. Watching with equal interest will be utility security analysts.

FPC has proposed amendments to the Uniform System of Accounts on the subjects along these lines:

1. Utilities may elect for accounting purposes to normalize income resulting from these tax reductions. But, if they do, credit must be made to a special tax reserve. Of course, if the reserve should be deducted from the rate base at any future time, it could have the effect of depriving the utility of any return on the plant assets which have been paid for by funds represented by this reserve.

2. Any utility availing itself of liberalized depreciation would use vintage-year accounting for tax depreciation rather than the composite method, which most utilities use.

3. The third proposal has created considerable controversy. It sets up a new reserve account, "Taxes on Income—Other," which shall be debited or credited as authorized or directed by the commission with tax reductions arising from differences in treatment of deductions—book and tax—other than from accelerated amortization or liberalized depreciation.

In the case of accelerated amortization, it has been generally recognized that appropriate accounting calls for normalization of the tax reduction with credit to a reserve or to restricted surplus.

These proposals stem substantially from the Amere Gas Utilities Co case. In this suit the Columbia Gas System petitioned FPC for permission to use normalized taxes and a reserve accounting method for tax deferrals resulting from liberalized depreciation. During the proceedings, much testimony was introduced by the intervenors to show that, on any growing property, use of the so-called liberalized depreciation method results, not in a deferral, but in a permanent cut of tax liability.

No Permanent Tax Cut

It was Columbia's contention that, for every individual year and every individual unit of property, there is no permanent reduction of taxes. It argued that a definite future tax liability arises as the tax depreciation deductions lessen, which does not happen with the straight-line method.

The use of vintage-year accounting for tax depreciation was, in Columbia's opinion, a way of demonstrating that no permanent reduction was involved. And too, there was in effect, actually a deferral. In this method separate, specific amounts of depreciation are set up and ap-

plied to each year's plant additions.

With regard to the reserve method of accounting for the resulting tax reduction, it is held that, if the claim is made that liberalized depreciation results in tax deferrals, there must be, collaterally, a future tax liability. Consequently, a reserve for this liability must be set up on the corporate books of account.

Proponents of the reserve method also contend that under no circumstances can a charge to income become a credit to the stockholder's equity, which, of course, is the case where a restricted surplus is used.

FPC Proposals Differ With Orders

In briefs filed by Edison Electric Institute and individual companies the principal line of argument is to the effect that the proposed accounting methods of the FPC often will run contrary to the orders promulgated by individual state commissions.

The general line of reasoning was this: Confusion and unnecessary expense would result from the imposition of the accounting treatment prescribed by FPC without any offsetting advantages to utilities.

Fundamentally, there is no need for imposition of any uniform accounting treatment of the tax reduction, as the alternatives authorized by the state commissions are appropriate for recording the facts in each situation and are in accordance with accepted accounting standards.

Commission Orders Vary

A number of utilities point out that, of 27 state commissions which have issued accounting orders on liberalized depreciation, 14 prescribed a reserve method and seven a restricted surplus method. Five commissions required one utility to set up a restricted surplus and another a tax reserve. Wisconsin Public Service Commission has ruled on the normalizing method but by a charge to depreciation expense and a credit to depreciation reserve.

Seven commissions have ruled on the handling of liberalized depreciation in rate cases. Two—Oklahoma Corporation Commission and the Public Service Commission of Indiana—issued orders to normalize taxes. Commissions in Pennsylvania, Maine, New Hampshire, New Mexico, and New Jersey have denied companies the benefits of liberalized depreciation.

Some utilities asserted the use of a reserve method deprives them of the substantial savings of financing their additional capital requirements by debt rather than by common stock. This argument ties into the general belief that utility analysts consider restricted surplus part of the common equity of a company. This is true to the extent that their opinions are important in rating both senior and junior securities.

EEI argued that companies using the restricted surplus method issued aggregate securities of about $1.3 billion. No independent public accountant has taken exception in the certification of accounts of firms using restricted surplus method.

AG&E Likes Restricted Surplus

The brief also noted: "Financial representation made by the companies concerned obviously have been relied upon by the purchasers of these securities and it is submitted that such representations should not be required to be modified, either directly or indirectly, at this comparatively late date."

The position of restricted surplus method supporters is summarized in a memorandum to FPC by American Gas & Electric Co. It said: "One of the great advantages of the restricted surplus method is that the restricted surplus account is recognized by financial analysts as part of equity. This makes good sense since the funds represented by restricted surplus are actually there as part of the equity cushion—to the very same extent as though they had reached surplus under the flow-through method.

"Moreover, where the period of accelerated amortization or liberalized depreciation has expired, the funds in the restricted surplus account will be used to pay a portion of the then current charges against revenue.

"This, in turn, will increase net income, and this increased income will return to (unrestricted) surplus. Of course none of this is altered by labeling an account 'reserve' instead of 'restricted' surplus, but there is the danger that the financial analyst community, which rates the bonds of utilities, will regard a reserve as an offset against an asset account, or as a provision for an existing liability, and not be willing to treat it as the equity it really is."

Doubt About Account Labels

It appears then, there is some doubt as to whether the mere labeling of an account "restricted surplus" or "special tax reserve" should make any fundamental difference in treatment accorded by a security analyst or the informed investor.

Some utility people say that in the treatment of liberalized depreciation only actual taxes should be shown and that the additional income, because of the lower taxes, flows through to an unrestricted surplus. A memorandum notation in the financial statements could show

HERE ARE THE TERMS . . .

- **Accelerated Amortization**
- **Liberalized Depreciation**
- **Vintage-Year Accounting**

HERE'S WHAT THEY MEAN . . .

Accelerated amortization permits a tax deduction over a period of five years for amortization of facilities certified by the government. Usually this amortization is allocated over the normal life of the property.

Liberalized depreciation permits the cost of the plant constructed after Dec. 31, 1953 to be depreciated on rapid depreciation methods, ie, declining balance and sum-of-the-years digits instead of uniformly over the life of the property.

Vintage-year accounting requires the maintenance of separate amounts applicable to the plant balances of each vintage year for each class, group or unit as to which different liberalized depreciation methods and service life expectancies have been used.

the amount arising from the deferral of taxes. However, this method of accounting should not deprive the utility of the benefits of either accelerated amortization or liberalized depreciation.

Rate making is the controlling element of whether a utility receives the benefits of accelerated amortization and liberalized depreciation or is denied these benefits.

This view was demonstrated in recent Pennsylvania Public Utility Commission orders in which the tax effect of liberalized depreciation was disallowed as an element of cost.

Conversely, the FPC held in the Panhandle Eastern Pipeline Co case (3 PUR 32 396, 1954) that deducting tax reserve on accelerated amortization denies benefits to a utility which Congress intended it to have.

Some utility people argue, "If you treat the reserve resulting from rapid depreciation as a deduction from the rate base, the utility may be deprived of the benefits intended by Congress." They claim this provision has been included in the tax law to stimulate spending for new plant and facilities.

Needed—A Competitive Return

It could be pointed out the customer may get the entire benefit from this method, while the company or stockholder accepts all the risk. Those holding this view say the obligation of the ratepayer is to provide the utility stockholder with a return which is competitive with that realized in industry, generally, adjusted for the relative risk.

Some electric utilities, as well as the EEI, say vintage-year accounting would be extremely difficult for most companies. It would necessitate the use of property records which many gas and electric utility companies do not maintain.

Public Service Electric & Gas Co told the FPC that it would cost an additional $1 million annually in field office clerical expenses alone if it undertook identification of property withdrawals by yearly installation. Vintage-year accounting would require this.

Many utilities cannot economically employ accounting methods requiring vintage-year accounting. They point out that the FPC has no jurisdiction over tax depreciation, which is a matter between the Internal Revenue Service and the taxpayer. The FPC, they say, should not prescribe vintage-year accounting.

EEI, in its brief, said the third proposal, creating a new reserve account "Taxes on Income—Other," does not seem to be required. If it should be included by FPC, it should be specified that the use of any such account is not mandatory.

ATOMIC PROGRESS

NUCLEAR NOTES

General Electric Co's 5-Mw prototype of the 180-Mw boiling water reactor slated for Commonwealth Edison Co went critical Aug. 5. The low-power experiments to check nuclear characteristics and determine procedures took place at Vallecitos, Calif. Full power runs will be "later this year," GE says. Prototype's heat will produce steam for Pacific Gas & Electric Co plant.

Carolinas Virginia Nuclear Power Associates is preparing an application to AEC to build a new type power reactor. Proposed plant will use a reactor not yet in commercial use, directors said. Target date for operation is 1962. Duke Power Co, Carolina Power & Light Co, South Carolina Electric & Gas Co, and Virginia Electric & Power Co are CVNPA participants.

Yankee Atomic Electric Co gets construction permit from AEC, providing requests for a hearing aren't forthcoming by Sept. 3. Determination of the company's financial qualifications will be made in August 1958. License for operation of the 134-Mw plant will be issued when tests prove plant safety.

First step for Northern States Power Co's AEC application was taken when the commission approved the utility's plans as a basis for contract negotiations. Proposal would have government pay part of research and development costs, permit Northern States to do some work in AEC sites, and waive fuel use charges to 1966.

An American may direct the International Atomic Energy Agency. Rep W. Sterling Cole (R-N.Y.) is under consideration as director general of the new agency, whose board of governors will make the selection.

Standards on international level progress. International Organization for Standardization's nuclear energy committee has undertaken areas of development and approval for **1.** Tri-lingual glossary, **2.** Warning symbol for ionizing radiation, **3.** Units for nuclear energy, **4.** Drawing symbols, **5.** Radiation measurement and protection symbols, and **6.** Guides for safe design, operation, and maintenance of nuclear reactors.

Some 108-million kwhr had been delivered from Calder Hall by the end of March. Electricity was "almost entirely from the first reactor," a U. K. Atomic Energy Authority report notes.

East Central Nuclear Group has been chosen as the name for a group of 12 Ohio Valley utilities which plan to tackle a $15- to $31-million reactor research and development program (EW, March 4, 1957, p50). The program is aimed at improving thermal economy in power reactors. Members are: American Gas & Electric Service Corp, Cleveland Electric Illuminating Co, Columbus & Southern Ohio Electric Co, Dayton Power & Light Co, Indianapolis Power & Light Co, Louisville Gas & Electric Co, Monongahela Power Co, Potomac Edison Co, West Penn Power Co, Ohio Edison Co, Pennsylvania Power Co, and Southern Indiana Gas & Electric Co.

THE NEWS-BEAT

Shasta's No. 5 Unit Faults

Fire originating in series connections has caused total stator winding loss on a 75-Mw generator at Bureau of Reclamation's Shasta Powerhouse in California. Unit No. 5 was carrying its full 90-Mw capability on July 28 when B and C-phase differential relays tripped. Interconnections picked up the load without incident.

Inspection revealed burning of 56 coil tops and about ⅓ the ring butts. Complete rewinding, but no iron restacking, is necessary. The machine will be out of service until about mid-December. A revenue loss of some $50,000 per month is estimated.

This is the second series connection failure for the machine. In 1952 a similar fire burned about ⅓ the stator winding on the opposite side, causing a one-month outage. Bureau engineers say insulation tests give no prior warning of this type fault. Although some insulation deterioration has been detected before, it was in no way responsible, they add.

Girk's Meter Saver

It was during off-duty hours on a Saturday back in 1952 when Serviceman F. P. Girken put together his first meter saver. For a few cents worth of lumber he made two racks that each held a pair of meters. Since then "Girk" hasn't broken a single electric "cash register."

Before the slender Arkansas Power & Light Co journeyman devised the racks, meter covers broken in transit cost the company more than $1,000 a year. Now the racks are being installed on all service trucks.

Capital Credits for Salt River

The first Kentucky cooperative to begin paying capital credits or refunds to members distributed $30,000 earlier this month. Some 4,500 consumers of Salt River Rural Electric Cooperative Corp power in 1948 and 1949 divided the money according to amounts of current used. Seven years of capital credits are held for working capital by the co-op.

Ben Franklin Wins Sponsor

A proposed 468,000-kw Ben Franklin dam across the Columbia River near Richland, Wash., won a sponsor ten days ago. Washington Public Power Supply System, meeting at Seattle, voted to request a preliminary FPC permit to study the project. It had been proposed earlier this month by Benton County PUD of Prosser, one of 17 PUD's belonging to the power system. Still a "paper" organization, the system was organized last February under an act passed by the '53 state legislature. The group has been studying a number of small projects in western Washington.

Low Man on the Totem Pole

Cooperatives shouldn't look on river development purely as another means of gaining low-cost federal power. Power production should be kept in proper perspective in relation to other benefits of multi-purpose basin development.

These were comments of Reclamation Commissioner W. A. Dexheimer before a recent meeting of national electric co-op press association and rural electric consumers publications at Estes Park, Colo.

Producing power is only one purpose of river projects "and in many instances it is low man on the totem pole," he told the editors. Federal sources of power are limited by hydro-electric phases of multi-purpose projects, he said. Thus, federal efforts in no way abrogate responsibilities of co-ops, municipalities, and private utilities to meet increasing U. S. energy needs, he added.

Back at the Old Stand

Federal Power Commission Chairman Jerome K. Kuykendall is back on the job after winning Senate confirmation last fortnight for reappointment to the commission. President Eisenhower made it official following the lawmakers' action.

Senate's 50-25 vote squelched opposition from Wayne Morse and other pro-federal power Senators.

Kuykendall starts another term with a controversial decision awaiting him. This is the question of whether to grant a license to Pacific Northwest Power Co for Pleasant Valley-Mountain Sheep dams on the Snake River. A staff recommendation opposes the license, the presiding examiner favors it, and it's now up to FPC to make the final decision.

Voltage Boatmen

It was back in June when high waters from Cyprus Bayou backed up river level near Jefferson, Tex. About 7 P. M., a bank-hugging, hit-and-run barge plowed into a Jefferson-Karnack line pole.

Sid Huffman's line crew arrived and waited until midnight for the repair work. They commandeered boats to attach two support lines to a nearby railroad trestle and another line to an anchor rod on shore. Then the winch line was played out from the truck and used to straighten the pole. The crew finished and oared to shore at 2:15 A. M.

Automatic Controls Put Spinning

New scheme acts in an emergency to detect drop in system frequency and change stand-by from motoring to generating

H. G. MARSHALL, Engineering Department, Central Maine Power Co, Augusta, Me.

An automatic spinning reserve has effectively removed the human element from the emergency operating procedure of converting a motoring hydro unit to a generator. This new control scheme at Central Maine Power Co's Harris Station detects a drop in system frequency and within 9½ sec changes a stand-by unit from motoring to generating.

The author believes that this is the first use of an automatic control scheme for a spinning reserve unit having a reaction-type turbine.

Generally, spinning reserve refers to the difference between the capability and output of a generator

Here Is Detailed Operating Sequence

The assumption is made that initially both units are operating as generators, and that Unit No. 3 will be selected for a spinning reserve set-up:

A. Turn selector switch 43G to its "Motor" position. Then Relay 96-1 is energized and picked up through contacts 1-1C and 4C-4 of switch 43G and contact 5-6 of 81AY; contact 2-8 of 96-1 seals in around the 1-1C contact of 43G. The white light is energized through contact 5-5C of 43G to indicate that a spinning reserve selection has been made. The green light is energized to indicate the proper circuit set-up to initiate motoring as soon as the load on the unit has been sufficiently decreased by manual control of the governor motor 65 MS.

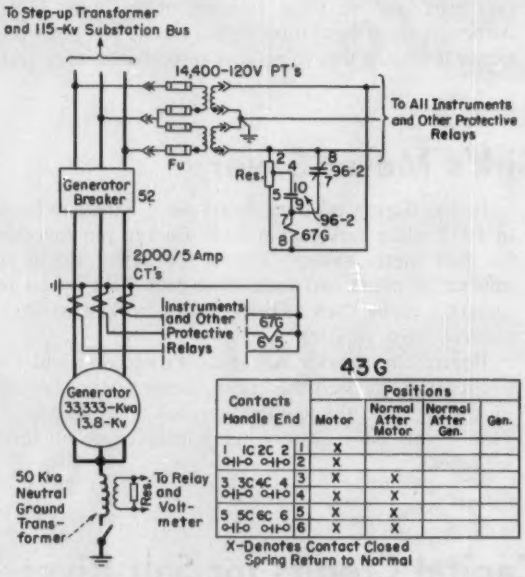
B. When the load on the unit has been decreased to approximately 400 kw (corresponding to 7.5% turbine gate opening) gate position switch 33-5 closes to initiate the change over to spinning reserve.

1. Coil 13-14 of auxiliary relay 96-2 is energized through the 2-8 contact of 96-1 and switch 33-5.
2. The red light is energized through 11-12 contact of 96-2 to indicate that the unit is operating as a spinning reserve (motoring).
3. The 5-6 contact of 96-2 opens to de-energize the governor main solenoid, causing the turbine gate to close.
4. The opening of 7-8 contact and the closing of 9-10 contact of 96-2 inserts resistance in series with the potential coil (7-8) of the reverse power relay 67G. This recalibrates relay 67G to allow motoring power.
5. The 1-2 contact of 96-2 closes to operate the governor motor to its extreme raise position.

The unit will thus operate under these conditions as a spinning reserve until it is returned to normal or to a generator through operation of the underfrequency relay device 81. The power required for motoring at 100% pf is 700 kw.

C. A 0.5 cycle decrease in system frequency to 59.5 cycles will cause underfrequency relay 81 to close its contact 3-4 to pick up its internal auxiliary 81A.

1. Coil 5-6 of auxiliary relay 81AX is energized through 1-2 contact of 81A. A contact of 81AX operates an annunciator (device 30 not shown on the diagram) which in turn energizes its auxiliary relay 30Y.
2. Coil 5-6 of auxiliary relay 81Y and its associated circuit is energized intermittently through the contact 2-8 of 30Y, 1-7 of 81AX and 3-7 of 81Y; causing the 1-7 contact of 81Y to be intermittently closed to provide a flashing blue light. This alarm feature is always present with low frequency conditions, regardless of whether the units are operating as spinning reserve.
3. Coil 5-7 of the auxiliary timing relay 2X is picked-up through contact 3C-3 of 43G and 7-8 contact of 81AY. Accordingly the timing relay 2 is started by closure of the auxiliary 2X contacts.
4. After an operating interval of 3¼ sec the 10-9 contact of device 2 closes to energize and pick up auxiliary relays 81AY and 81AZ which become sealed in through the 11-12 contact of 81AY. (This last operation initiates the change of the unit from motor to generator.)
5. The governor dash-pot by-pass valve solenoid 11-12 is energized through the 6-6C contact of 43G and the A-B contact of 81AY. (Thus the governor mechanism is free to act without the normal restriction of its compensating dash-pot.)
6. The timing auxiliary relay coil 7-5 is de-energized by the opening of the 7-8 contact of 81AY, which in turn de-energizes filming device 2.



Reserve on Line in 9½ Seconds

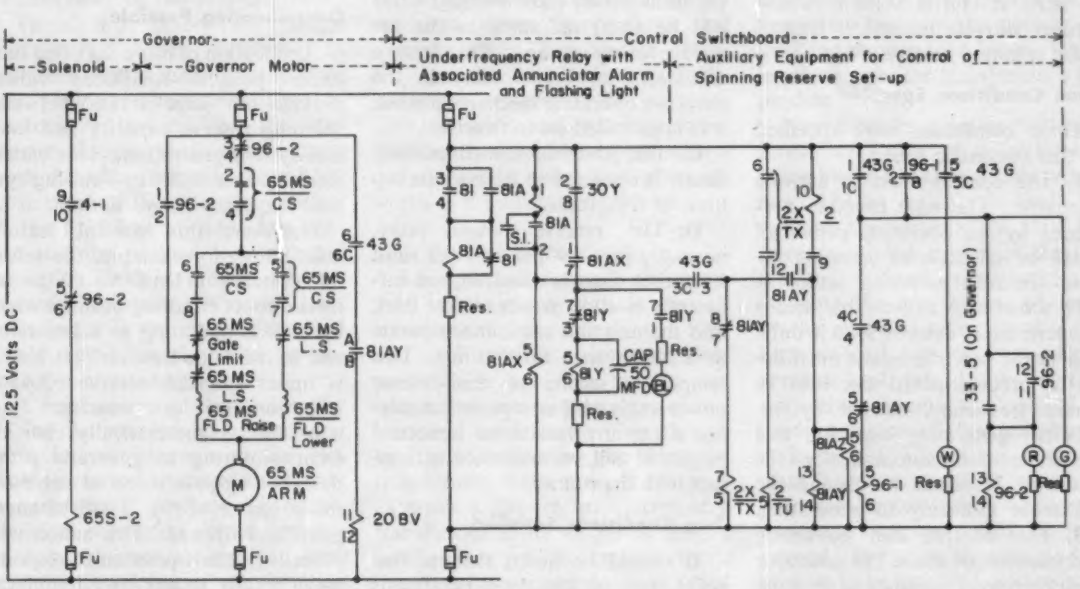
producing less than 100% capability under existing conditions. The prime mover of the unit may be for steam, hydraulic, or combustion fuels.

As the system load changes, the output of each generating unit, when correctly adjusted and coordinated, will tend to increase and decrease by action of its associated governing equipment. Each unit will thus take its proportionate share of the load change.

The term "spinning reserve," however, as used in this article, applies to a particular operating condition of a hydro generating unit. This condition occurs when there is no hydraulic power applied to the turbine (its gates being closed) and the generator being connected to the system operates as a synchronous motor at rated speed.

This spinning reserve scheme has been employed for many years by operating utilities having sizeable hydro generation. Object of this practice is to have a large unit operating at rated speed in readiness to take on generation in event of

# of CMP's Automatic Spinning Reserve



2 Time delay relay
2X Internal auxiliary relay for device 2
4-1 Master contactor (coil not shown in diagram)
20BV Solenoid valve—by-pass to governor dash-pot
30Y Annunciator bell drop auxiliary relay
33-5 Turbine gate position switch (closed at 7.5% gate and below 7.5% gate is equivalent to approximate 400-kw output of generator)
43G Selector switch (motoring or generating)
65S-2 Governor solenoid (de-energized to close turbine gates)
65MS Governor control motor
67G Reverse power relay
81 Underfrequency relay — operating coil connected to potential device on 115-kv bus (not shown on drawing)
81A Internal auxiliary relay to device 81
81AX Auxiliary relay for device 81A
81AY Auxiliary relay for device 81A
81AZ Auxiliary relay for device 81A
81Y Flasher relay (for device 81 indicating light)
96-1 Auxiliary motoring relay
96-2 Auxiliary motoring relay

7. The 5-6 coil of relay 96-1 is de-energized by the opening of the 5-6 contact of relay 81AY. The opening of the 2-8 contact of relay 96-1 de-energizes the 13-14 coil of relay 96-2; as well as the red and green lights.

8. The closure of the 5-6 contact of 96-2 re-energizes the main governor solenoid 65S-2, causing the turbine gates to open their full stroke or to any intermediate point previously selected by the gate limit device on the governor. The rate of gate opening is measured at 5 sec between 10 and 90% gate opening. Actually, with maximum net hydraulic head, full load of the unit is obtained at about 70% gate opening.

9. It should be noted that the automatic transfer of the unit from spinning reserve to generator has automatically re-set the control circuits for normal generation. The white light will remain energized until, as a matter of operating procedure, the selector switch 43G is turned to its generating position.

a sudden loss of another major unit or inter-system tie line.

Normally, a manual operating procedure is used to change this motoring unit to a generator. Therefore, it is necessary for the station operator to detect a deficiency in system generation and bring the unit under generation by normal control. This action requires operation of the governor motor or gate limit, as the case may be. Placing the human element into the control necessarily inserts a variable time delay at a time when it may be of extreme importance to restore ample generation with least delay.

To remove the human element from this emergency procedure, it was decided to incorporate special features in the design of two 30,000-kw units at Harris Station. These features provide automatic control under spinning reserve.

Three Conditions Specified

Three conditions were specified for this automatic scheme:

1. The control must be entirely automatic. The only function performed by the operating personnel would be selection of spinning reserve—or unit motoring setup, as it is sometimes called—by means of operating a control switch only.

2. Some positive means must detect a predetermined decrease in system frequency, caused by insufficient generating capacity, and set in motion automatically the necessary functions to change the unit from motoring to generating.

3. The control and governing equipment must cause the generator to pick up load rapidly and thus assist in restoring normal frequency.

The accompanying description of the operating procedure for setting a unit up under spinning reserve and then changing automatically to generation shows that the scheme fulfills the above conditions.

Each generating unit has on its switchboard control panel a multi-contact, three-position selector switch with positions marked Generator, Normal, Motor and with spring return to Normal. This switch permits selection of a spinning reserve setup while a unit is operating as a generator at any load from zero to full load.

If the unit is under load, the operator makes the motoring selection and then decreases the load on the unit in the usual manner by control of the governor motor. When the load has been reduced to "approximate 400 kw," representing about 7.5% turbine gate opening, the control is automatically taken away from the operator. From this point on, the operation is entirely automatic. Only indicating lights tell the operator that the proper setup for spinning reserve control is satisfied.

This is what has taken place by means of auxiliary relays associated with the control:

A. The main solenoid of the governor has been de-energized, and the gates are thus being held closed by full 300-psi oil pressure in the servomotor.

B. The circuit is set up so that the dash-pot by-pass solenoid valve will be energized later in the sequence of operations. This feature eliminates any time delay in the governor operating mechanism when it is later called on to function.

C. The governor (synchronizing) motor is operated to its extreme top limit of 5% Raise.

D. The reverse power relay, normally set to prevent the unit from motoring, is de-calibrated sufficiently to allow power to flow back into the unit and cause it to operate as a motor with turbine dry. This temporary setting of the reverse power relay will not permit motoring if for any reason an abnormal height of tail water comes in contact with the runner.

Two Conditions Satisfied

It should be noted that, at this point, two of the three conditions outlined above have been satisfied. This control setup has been automatic (No. 1). Also, by removing the inherent time delay effect of the governor dash-pot, as well as operating the governor motor to its extreme Raise position, the governing equipment is all set to open the turbine gates in minimum time when the main solenoid of the governor is re-energized (No. 2).

A frequency sensitive relay is the key which sets the sequence in motion. Operation of this relay, now set at 59.5 cps, initiates a timing device which inserts about a 3¼-sec time delay in the operating sequence. At the end of this delay the governor main solenoid is re-energized to cause the turbine gates to open. The governor is adjusted to provide a rate of gate opening corresponding to 5 sec as measured over 0.1 to 0.9 range.

The overall time in the sequence is 9½ sec from the closing of the relay contacts to the instant the unit is producing full load at approximately 0.7 gate opening.

One inherent element in the application of this control, although not objectionable within limits, does not allow setting up more than one unit at a time under spinning reserve. The reason is that, when the unit automatically changes from motor to generator, it will pick up full load or any intermediate load corresponding to the setting of the gate limit control, regardless of the amount of deficiency in generation.

Over-shooting Possible

Application of more than one unit under present conditions would provide too large a ratio between spinning reserve capacity and normal system generation. This would result in over-shooting—raising system frequency above normal.

However, this control feature does allow, for example, the selector switch for Unit No. 2 to be turned to its motoring position when the unit is operating as a generator and at the same time as Unit No. 3 is under spinning reserve. No. 2 will continue to generate. But, when No. 3 automatically changes from motoring to generating, the dash-pot by-pass solenoid valve on the governor of No. 2 will be energized and opened. This action will place No. 2 in a position to respond more readily to any over-frequency caused by over-shooting of No. 3.

To eliminate the necessity of this precaution, a redesign of the control scheme is planned for future applications. The initiating device will temporarily change the speed droop of the governor (normally set on this system at 4%) to zero, resulting in an isochronous governor.

Under this setup more than one unit could be operating as a spinning reserve and, when called on for generation, would automatically pick up the deficiency in system generation. This would restore frequency without over-shooting.

The author wishes to acknowledge the assistance of William A. Bagley in the design and application of this control feature.

Factors of loss product and loss ratio enable users to . . .

Measure Quality of Transformers

A. N. GARIN, Development Engineer, Large Transformer Dept, General Electric Co, Pittsfield, Mass.

Loss product factor, with its related value loss ratio factor, is the best yardstick for measuring the quality of transformers and evaluating progress achieved by transformer manufacturers. With the progress already achieved properly evaluated, the user is in a better position to give the manufacturers a clear directive on the preferred "transformer of the future."

These two factors are design parameters better known to designers than to users of transformers. They have become indispensable tools for fast, rational, and consistent design work, particularly work done by electronic computers. Loss product factor is the product of the load loss at rated kva output and the no-load loss at rated excitation, both expressed in percent of transformer kva rating. Loss ratio factor is the ratio of the load loss at rated kva output to the no-load loss at rated excitation.

A brief review of the philosophy behind the concepts of product and ratio factors begins with the fact that power transformers exist only to transform power. Therefore, principal operating characteristics of a transformer are no-load loss, load loss, reactance, and exciting current. Insulation, heating, noise, and other secondary characteristics must be considered but do not contribute directly to the transformation of power.

Characteristics Limited

With all characteristics interrelated, a change in one generally entails changes in several others. This follows because every characteristic depends on some physical component of the transformer, and most components affect several characteristics. Thus the wide selection of characteristics obtainable for any transformer is still a strictly limited choice.

Often it is more profitable to study characteristics in pairs, or in even larger groups, instead of one at a time. Often products or ratios of simultaneous values of different characteristics disclose fundamental information hidden from view until such products or ratios are formed.

Transformation of power is accomplished only through the interlinked magnetic and electric circuits. The two physical components are the iron of the core and the copper of the windings. In different transformers the core and windings structures come in different sizes, shapes, proportions, and arrangements. They contain different amounts and different quality of active materials. To compare different core and winding structures, each should be tagged with a definite single value that gives its worth as a transforming device.

Loss Product is Yardstick

Loss product factor is the common yardstick applicable to all transformers, regardless of type and construction. Moreover, this yardstick is available to any one who knows the tested values of no-load and load losses, even though he may know nothing else about the transformer. Loss product factor is as much a physical parameter of a transformer as its weight or length, independent of the transformer's use or what nameplate is attached to it. By overexciting or underexciting a transformer, by overloading or underloading it, losses and the ratio of losses are changed. But loss product factor cannot be changed any more than the transformer's weight or length.

Factor is Built into Design

The fact that loss product factor is "built into" a transformer may be verified readily. Consider a self-cooled transformer with a rated nameplate kva of 100%. At that load it will have certain values of no-load and load losses. Dividing these losses in kw by the 100% nameplate kva provides percent no-load and percent load losses. Utilizing these gives the transformer's loss product factor.

Now consider uprating this transformer to 133% of its self-cooled rating by the addition of fans. At the new 133% rating, no-load loss remains the same while load loss increases as the square of the current to 178% of its original value. Dividing the new values of losses by the new kva rating gives a percent no-load loss of 75% and a percent load loss 133% of their respective original values. Loss product factor of the transformer at its new 133% rating is exactly what it was at its 100% rating.

In service only small changes in excitation voltages need be considered. For such changes no-load losses may be assumed, without serious error, to vary as the square of the voltage. On this basis, calculation

How Factors Are Derived and Used

When transformer losses are known:

$$\text{Loss Product Factor} = \text{Percent Load Loss} \times \text{Percent No-Load Loss}$$

$$\text{Loss Ratio Factor} = \frac{\text{Percent Load Loss}}{\text{Percent No-Load Loss}}$$

When the two factors are known, losses at rated kva output and excitation are:

$$\text{Percent Load Loss} = \sqrt{\text{Loss Product Factor} \times \text{Loss Ratio Factor}}$$

$$\text{Percent No-Load Loss} = \sqrt{\frac{\text{Loss Product Factor}}{\text{Loss Ratio Factor}}}$$

similar to the above shows that loss product factor cannot be changed by overexciting or underexciting a transformer.

Independence of loss product factor of loading and excitation conditions in service suggests that there must be some fundamental significance in this concept. This may be shown by expressing loss product factor and loss ratio factor in terms of basic parameters. Review of Table I prompts these statements:

1. For a specific transformer rating, loss product factor obtainable from a given amount of active materials (core iron and winding copper) is fixed definitely by the state of the art.

2. At any state of the art, for a specific transformer rating, there is a definite normal value of loss product factor corresponding to the normal amount of active materials in the transformer.

3. Lower than normal loss product factors can be obtained, at any state of the art, by using larger than normal amounts of active materials. But lower loss product factors obtained by this "brute force" method do not appear to be economical.

4. As the art develops, designers find ways of obtaining lower loss product factors from the same amounts of active materials. Such reductions in loss product factors are direct evidence and a measure of progress in the art.

5. Historically, transformer designers succeeded in obtaining gradual reductions in loss product factors without increasing the active materials, and concurrently with reductions in weights and dimensions of transformers, as shown in Fig 1.

6. In contrast with the loss product factor, the nature of the loss ratio factor is such that the designer has considerable freedom in obtaining the value preferred within rather broad limits and without impairing overall design economy.

7. While a lower loss product factor obtained without increasing the amounts of iron and copper is evidence of progress in the art, an exceptionally low value of load loss or no-load loss by itself is more likely to be an indication of a distorted design.

8. In any self-consistent line of designs, the laws of variation of loss product factors with kva ratings and with BIL's are not the results of arbitrary decisions of transformer manufacturers but of natural laws, as is shown in Fig 2.

These conclusions appear practically self-evident from the two

Table I—Loss Product and Loss Ratio Factors in Terms of Basic Parameters

(Numerical coefficients omitted)

Design Parameters and Operating Characteristics	Core Design Parameters and No-Load Loss	Winding Design Parameters and Load Loss
Cross-section, sq in.	A_1	A_2
Mean length, in.	L_1	L_2
Flux and current densities, percent of reference densities	D_1	D_1
Losses, watts per cu in. at reference densities	w_1	w_2
Output, kva	$Kva = A_1 A_2 D_1 D_2$	
Losses, kw	$W_1 = w_1 A_1 L_1 D_1^2$	$W_2 = w_2 A_2 L_2 D_2^2$
Losses, percent	$\%\,W_1 = w_1 \frac{L_1}{A_2} \frac{D_1}{D_2}$	$\%\,W_2 = w_2 \frac{L_2}{A_1} \frac{D_2}{D_1}$
Loss product factor	$(\%\,W_1)(\%\,W_2) = w_1 w_2 \frac{L_1}{A_2} \frac{L_2}{A_1}$	
Loss ratio factor	$\frac{\%\,W_2}{\%\,W_1} = \frac{w_2}{w_1} \frac{L_2}{A_1} \frac{A_2}{L_1} \left(\frac{D_2}{D_1}\right)^2$	

simple formals for loss product factor and loss ratio factor in Table I. Nevertheless a clear understanding of the significance of every symbol in the formulas may be required. Parameters in Table I apply for single-phase transformers or for each phase of 3-phase units. Cross-sections (A_1) and (A_2) are net cross-sections of the flux-carrying iron in the core and of the current-carrying copper in the windings, respectively. Mean length (L_1) and (L_2) are parallel to the directions of flow of the flux and the current, respectively.

By visualizing the interlinked magnetic and electric circuits, it may be seen that mean length of the magnetic circuit (L_1) must surround one-half the cross-section of the magnetic circuit (A_1). In addition, it must enclose the whole cross-section of the electric circuit (A_2) plus the cross-section of all the intervening insulation and ventilation spacings inside and between (A_1) and (A_2). Similarly, mean length of the electric circuit (L_2) must surround one-half the cross-section of the electric circuit (A_2), in addition to enclosing the whole cross-section of the magnetic circuit (A_1), plus the insulation and ventilation spacings.

Select Reference Density

No-load loss is shown to vary as the square of flux density. This approximation is valid only for small variations in density encountered in normal design practice and for small variations in impressed voltage in normal service. In any specific investigation, accuracy of the analysis always can be improved by selecting the reference flux density (with corresponding watts per cu in. at that density) in the immediate vicinity of the densities considered. Load loss is shown to vary as the square of current density. Although this relation is not absolutely rigorous, the error is negligible even for very wide variations in density.

Statements 1 and 2 now may be proved. The most striking feature of the loss product factor formula is that flux density (D_1) and current density (D_2) do not appear in it. This has two important consequences. First, it explains why loss product factor of a given transformer cannot be changed by over-

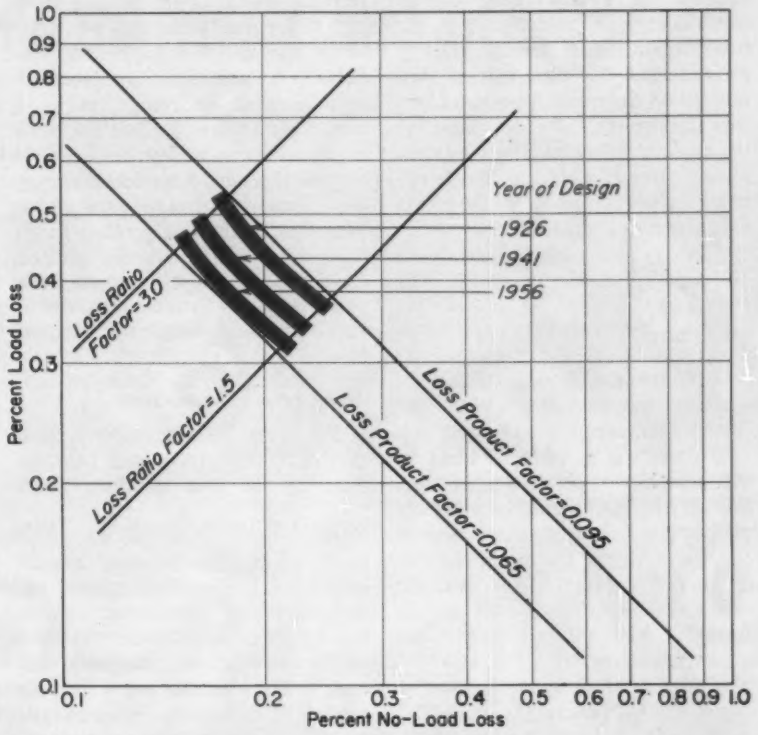


FIG 1—GRADUAL REDUCTION has been made in losses of transformers. Compared are designs for a 3-phase self-cooled 37,500-kva transformer, 550-kv BIL

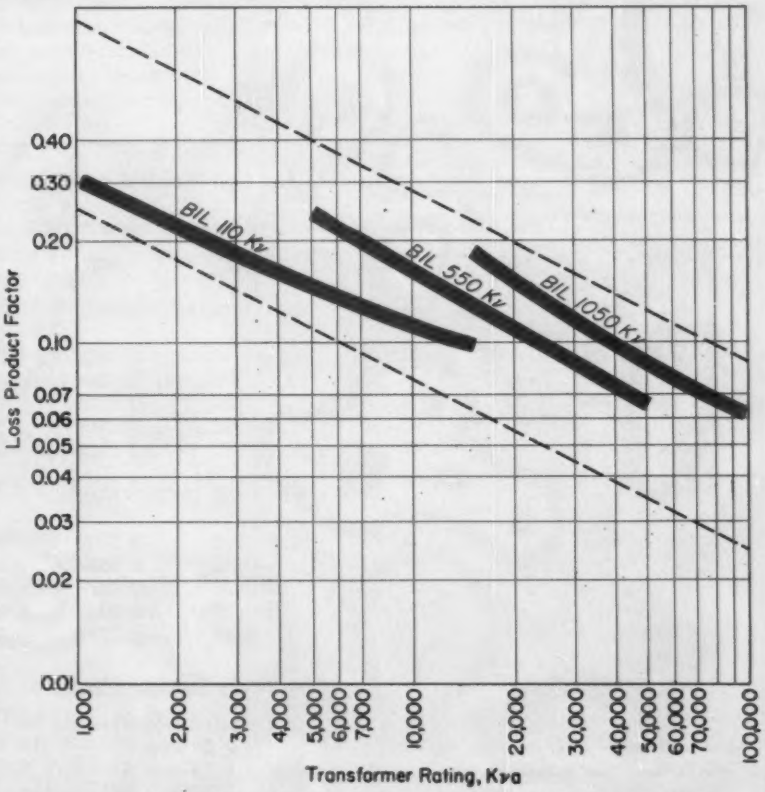


FIG 2—TYPICAL LOSS PRODUCTS for modern 3-phase self-cooled transformer vary inversely as square root of kva rating, indicated by slope of dotted lines

exciting or underexciting or by overloading or underloading the transformer. Flux density (D_1) is proportional to the voltage impressed on the transformer, and current density (D_2) is proportional to the load current carried by the transformer. Because neither density appears in the formula, loss product factor remains unchanged.

Second, loss product factor of a given design cannot be changed by the designer when he retains the same amount of core iron and winding copper and the same shapes and dimensions of the core and the windings (so as not to change the dimensions, weight, and cost) but just alters the number of turns in the windings. For such a change, flux density (D_1) would be inversely proportional, and current density (D_2) directly proportional to the number of turns. But because neither densitiy appears in the formula, loss product factor remains unchanged.

If loss product factor cannot be improved by changing (D_1) and (D_2) while their product is held constant, can the factor be improved by changing (A_1) and (A_2), keeping their product constant, as must be done to obtain the same kva rating? In other words, could the loss product factor be improved by using more iron and less copper, or vice versa? A large shift in either direction must be ruled out as it would too radically affect the overall dimensions, weight, and cost of the transformer. A moderate change also leads to disappointment, as indicated by the loss product factor formula. As long as the product (A_1) (A_2) is kept constant, loss product factor is affected only by relatively small incidental changes in (L_1) and (L_2).

Depends on Shape, Size

For proof of statement 3, note that (L_1), (L_2), (A_1), and (A_2) appear in the loss product factor formula as ratios $\frac{L_1}{A_2}$ and $\frac{L_2}{A_1}$. These ratios of lengths to areas are dimensional. Therefore, their numerical values depend not only on the shapes but also on the sizes of the electric and magnetic circuits. For geometrically similar shapes of different size, each ratio must vary inversely as linear dimensions, and the product of the ratios inversely as the square of linear dimensions. Consequently, for geometrically similar core and winding structures of different size, loss product factor varies inversely as the square of linear dimensions.

Thus, without waiting for any advances in technology, the designer always can obtain a lower loss product factor by increasing the size of the core and winding structure (amount of active materials). Because the weight of active materials varies in direct proportion to the cube of linear dimensions, the process is not particularly attractive. For example, a 15% increase in weight and cost of the core and winding structure would be required to obtain a 10% reduction in the loss product factor, or a 5% reduction in total losses.

Table I shows that at constant densities (D_1) and (D_2) the kva rating of a transformer is proportional to (A_1) (A_2). In other words, at constant densities the kva rating varies as the fourth power of linear dimensions. In the above example, the designer would have to lower densities (D_1) and (D_2) to retain the original kva rating in spite of the increase in linear dimenisons.

Reduction in loss product factor, however, was due entirely to the increase in active materials, not to

(*Continued on page* 114)

Table II—Loss Product Factors for Self-Cooled 60-Cycle Power Transformers

(For forced-oil-cooled transformers enter table with 60% of nameplate kva)

BIL	110	350	550	650	825	1050	1175
3-PHASE TRANSFORMERS							
Kva							
12,000	0.0970	0.1200	0.1310	0.1350	0.1520	0.1730	.....
30,000	0.0652	0.0716	0.0776	0.0804	0.0876	0.0984	.....
50,000	0.0520	0.0540	0.0584	0.0600	0.0644	0.0723	0.0790
120,000	.....	0.0351	0.0383	0.0399	0.0423	0.0480	0.0520
300,000	.....	0.0260	0.0292	0.0303	0.0330	0.0362	0.0390
SINGLE-PHASE TRANSFORMERS							
Kva							
12,500	0.0705	0.0794	0.0860	0.0890	0.0976	0.1100	.....
20,000	.....	0.0610	0.0665	0.0684	0.0740	0.0846	0.0904
40,000	.....	0.0422	0.0458	0.0474	0.0508	0.0576	0.0626
100,000	.....	0.0297	0.0329	0.0342	0.0369	0.0410	0.0442
200,000	.....	.....	0.0269	0.0278	0.0305	0.0332	0.0357

Loss Ratio Factor Limits

BIL	Self-cooled Transformers	Forced-oil-cooled Transformers
250 and below	2.0 to 3.0	4.2 to 6.5
450–650 incl.	1.75 to 2.6	3.75 to 5.75
750 and above	1.5 to 2.25	3.25 to 5.0

Vacuum Units Switch Capacitors

Switches show favorable economics at subtransmission and distribution levels

JOSEPH W. RITTENHOUSE, Technical Director, Hi-Voltage Equipment Division, Joslyn Mfg & Supply Co, Chicago, Ill.

Economics of switching capacitor banks at subtransmission and distribution voltages with vacuum switches are tremendously more favorable than for previous equipment. This is the conclusion drawn after field testing vacuum-switch equipment on the properties of three utilities.

The demonstration program, started 18 months, ago reveals:

1. Vacuum-switch installations need not deviate from normal utility construction practices.

2. Satisfactory operation is independent of climatic conditions.

3. Conventional operating techniques are applicable to vacuum switches.

The first installation, in the relatively open plains, switches a 13.8-kv, 1,500-kvar capacitor bank on the system of Public Service Co of Oklahoma. This bank represents a switching load of about 63 amp. The manually-operated switch is opened and closed about once daily. More than 167 open-close cycles have been completed satisfactorily.

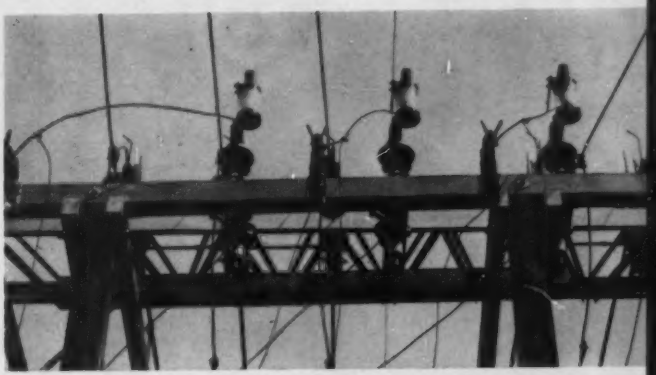
The second installation, in a hot, humid climate, switches a 33-kv, 5,000-kvar capacitor bank for Kansas City Power & Light Co. In this case, a time-clock-controlled motor-operated switch opens and closes about once daily. There is no sign of trouble after more than 100 open-close cycles.

The third installation, in northeastern Ohio, switches a 4.34-kv, 1,500-kvar capacitor bank on the Cleveland Electric Illuminating Co system. In this location extremes of temperature and precipitation are predominant in the winter. Ice and snow conditions were of particular significance in testing the switch enclosure. More than 276 open-close cycles have been completed satisfactorily.

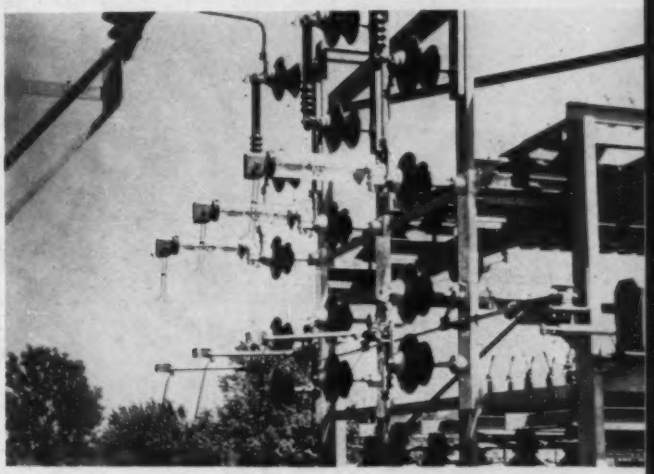
Following about 100 open-close cycles on the Kansas City system, the vacuum units were removed for complete analysis. Each phase of the interrupter unit consists of two R9G vacuum switches in series. Switches are made by Jennings Radio Mfg Corp (EW, July 25, 1955, p 179). Removal and examination of the tungsten contacts, inner glass shield and bronze bellows of two switches showed no evidence of deterioration.

Tungsten contact surfaces were in "as new" condition. Other internal elements revealed no evidence of deterioration. Electrical investigation of the remaining four units showed no changes. Units were re-installed for continued observation.

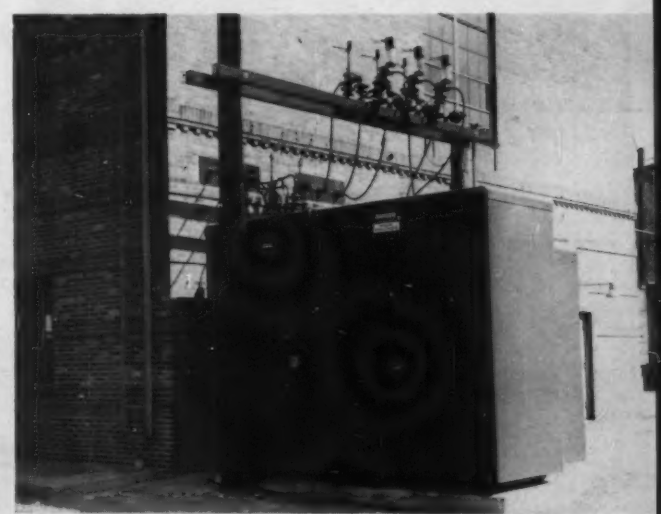
It is significant that none of the three installations has yet required any maintenance of the vacuum switch units; nor is there any indication of future maintenance. However, because the vacuum switch is a new device, application should be made with proper respect for its capabilities and limitations.



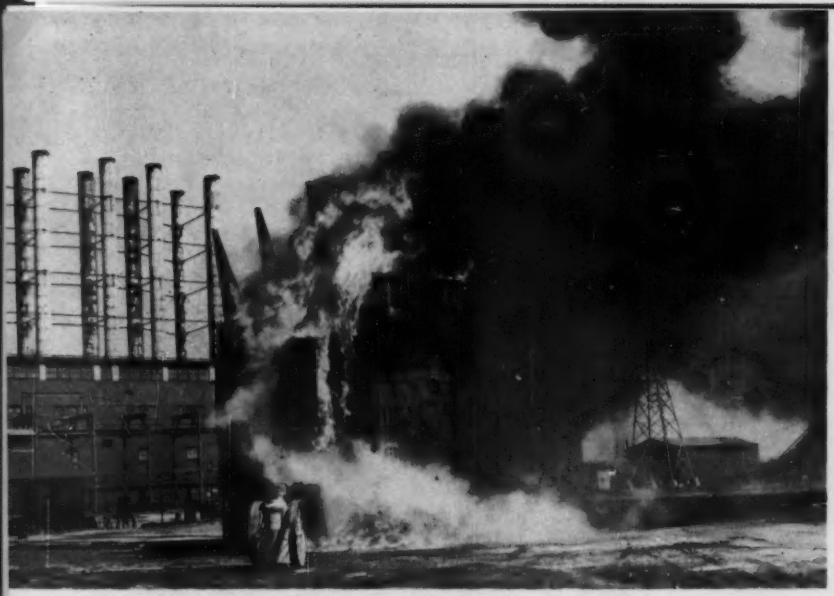
OKLAHOMA TEST installation of gang-operated switches was made in the same manner as for conventional disconnects



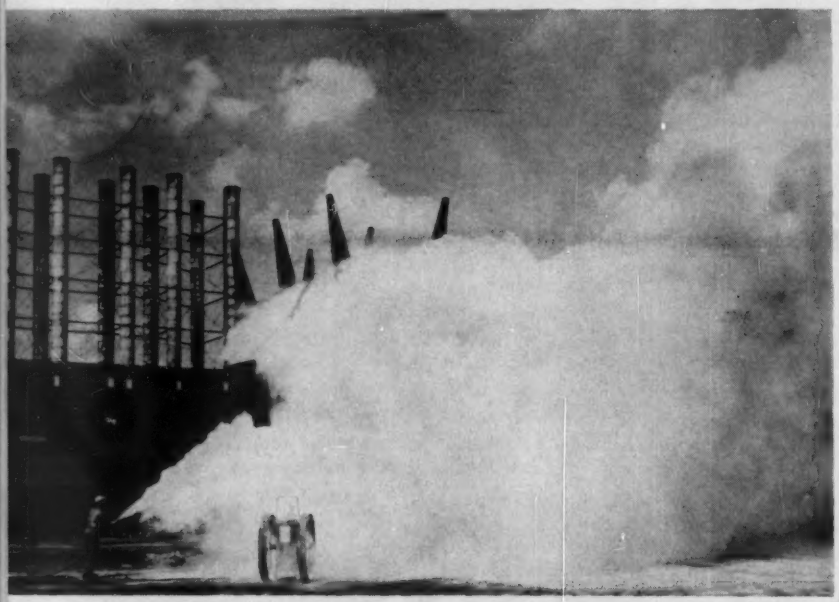
KANSAS CITY installation was tested after 100 open-close cycles. No evidence of contact deterioration was found



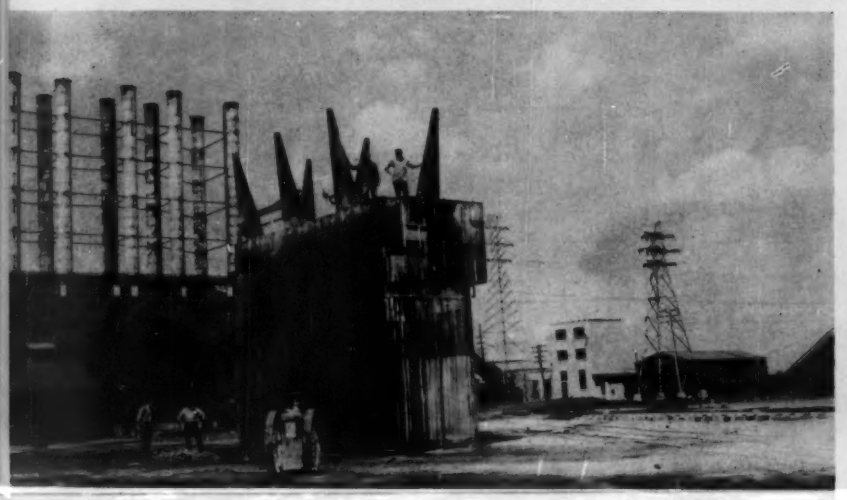
CLEVELAND TEST uses vacuum units to switch totally-enclosed capacitors. As extensive testing is planned, backup is provided by an oil switch installation in the building



FLAMING OIL runs to the ground as fire burns freely on the top and sides. Oil was preheated to 260F for discharge on the top of the 400-Mva mock-up



DRY CHEMICAL from fixed nozzles covers and extinguishes high-level flames. Ground-level attack with portable extinguisher supplements the fixed nozzles



FULL-SCALE MOCK-UP of 400-Mva transformer fitted out with nozzles and piping underwent several tests to determine effectiveness of the dry chemical system

SUBSTATION—Design

Dry Chemical

• Fires extinguished on units up to 400 Mva in mock-up tests by Pennsylvania P&L

EARLE F. WEAVER, Consultant,* Nuangola, Pa.

As a proven alternative to automatic water deluge systems for fighting transformer fires at attended or unattended substations, dry chemical protection has passed tests of the utmost severity. However, where water is available in adequate quantity, at suitable pressure, and at reasonable cost, it is still preferable, in general.

Recently, as the climax to a long series of similar checks upon performance, an installation on a mock-up of a completely simulated 400-Mva transformer passed every requirement for the protection of such equipment. It can be concluded safely that manually-operated dry chemical (sodium bicarbonate) facilities can be designed for the largest transformers in use today and that automatically operated systems can serve well for certain outdoor transformer hazards.

Seven Conclusions

Specific conclusions resulting from these tests include:

1. Each installation, number, type, size, location and position of nozzles must be individually engineered for the job.

2. Complete coverage of the entire surface of the transformer and surrounding ground fire area must be made by the chemical.

3. Adequate quantity of chemical must be discharged at a definite flow rate for effective and permanent extinguishment.

4. Barriers are not necessary to overcome wind conditions if nozzle coverage is adequate.

5. Fixed-nozzle dry chemical systems offer effective and less costly protection where automatic operation is required, especially where water for deluge types is in limited

* At time of writing, the author was Superintendent of Tests for Pennsylvania Power & Light Co, Hazelton, Pa.

Passes Test of Transformer FIRES

supply or too expensive.

6. If the requirements above can be met unconditionally, automatic actuation is both feasible and desirable.

7. Where fully automatic operation is not necessary or cannot be justified economically, a simple and less-expensive system may be designed. This type of system, using fewer nozzles, can be operated manually to provide complete protection under most conditions. But it may require a limited amount of ground assistance, especially under adverse wind conditions.

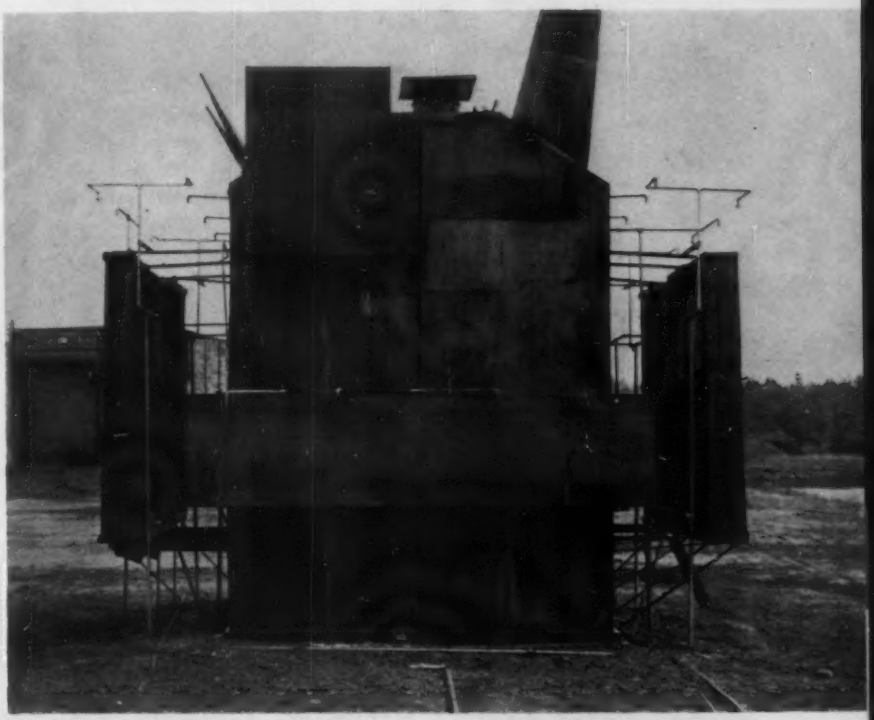
Cover is Top Hazard

Most likely place for a transformer fire to occur is on the cover, following a bushing failure. Sufficient oil may be ejected to cause side and ground fires. Release of flaming oil through pressure vents, following winding or other internal failures, can create hazards similarly. Spill fires, covering sides and ground only, can be handled by one or two trained men using portable hose streams or portable extinguishers of suitable size. But cover fires on tall transformers are beyond the range of such equipment.

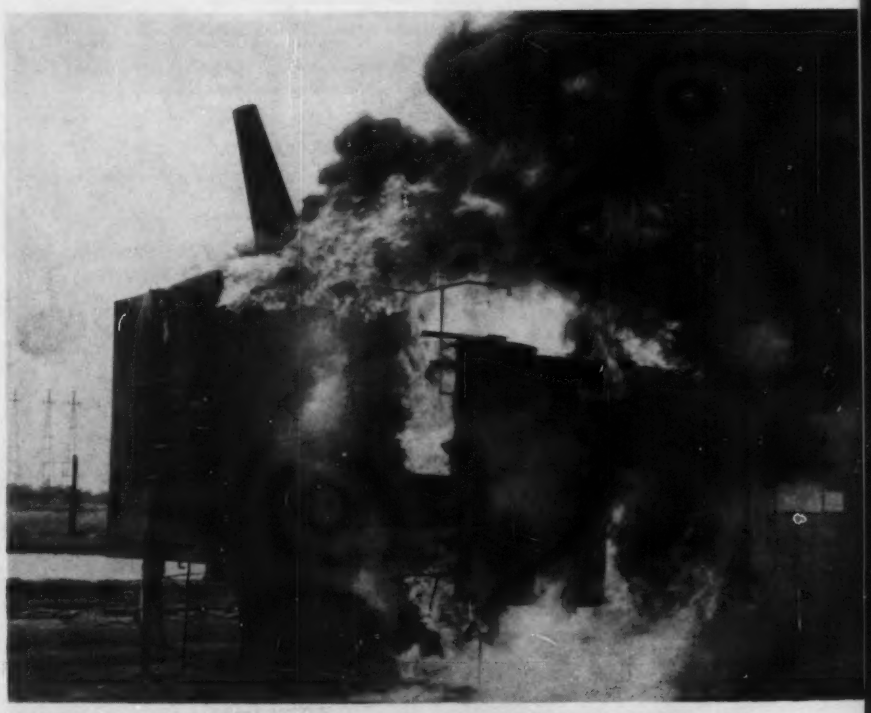
Automatic water spray fire protection of conventional design requires a large number of nozzles with a pressure of 35 to 45 psi at each. Quantity of water needed depends upon the shape and physical dimensions of the transformer. It may reach 200 gpm for a 2,500-kva unit, 600-700 for 10,000, and 800-1,400 for 50,000 or 75,000. This can run into money.

Installation Cost $32,000

At one location Pennsylvania Power & Light Co spent $32,000 for a well, storage tanks, pumps, etc, to protect one 75,000-kva transformer automatically and provide water for hydrant and hose systems in the switchyard. The installation also fed some small incidental water services. The more recent "high-capacity" water protection systems use fewer nozzles. Possible only four or six nozzles might be required. Water requirements and overall cost, however, would be nearly as high as for a conventional



PIPING AND 64 NOZZLES for an automatic dry chemical protection system are arranged for maximum coverage on a mock-up of a 75,000-kva transformer



INTENSITY OF FIRE is typical of tests arranged to evaluate various nozzles and arrangements in development of a 64-nozzle automatic dry chemical system

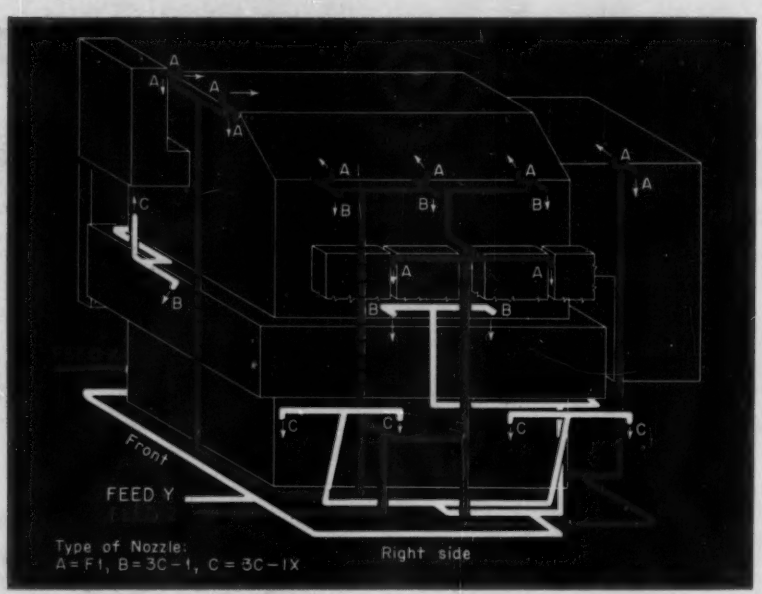
EXPLOSIVE VALVE is triggered electrically by a thermostat to pressurize 350-lb dry chemical tanks with nitrogen

water protection system.

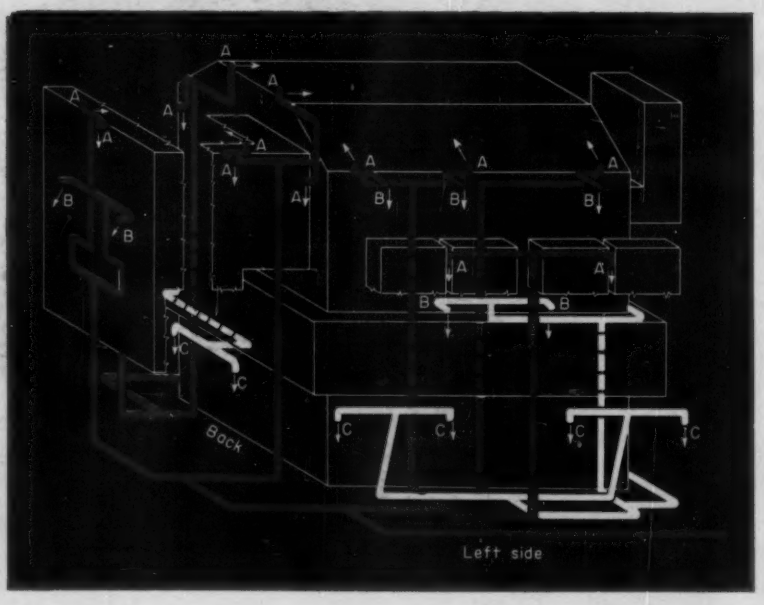
Tests with dry chemical systems have been embracive. They covered fires on actual transformers or mock-ups from 750 kva through 50,000, 75,000, to 400,000. On the latter, with 90-sec preburn, a simulated bushing fire on the cover of this unusually tall transformer was extinguished by manual control in 10-12 seconds without ground assistance. During all tests oil was heated to 260F for discharge on the transformer at 210-230F.

As indicated previously, each successful installation must be literally hand-tailored to local conditions. As many as 64 nozzles discharging from four different levels of piping were estabilshed for a fully automatic 75,000-kva installation. For a 48-nozzle system the estimated cost is $5,000 per transformer and $6,000 for a 64-nozzle system. These costs include all piping, fittings, nozzles, dry chemical units, thermostats and automatic actuating equipment and including labor of installation.

However, if but one transformer is to be protected, a spare complement of dry chemical units, with quick-coupler connections, should be provided initially, at an added cost of about $2,000 and $2,500, respectively. Should a second transformer be installed later, the spare complement would provide the normal protection for the second unit and still serve as back-up protection for the first transformer, and vice versa. Experience with the 64-nozzle system has shown that even with oil-spill to windward, test fires can be extinguished automatically and completely in 10-20 sec on a 75,000-kva transformer.



PIPING LAYOUT for manually-operated 48-nozzle dry chemical system has three feeds for adequate coverage of all sides and top of 75,000-kva transformer



Simple Device Adopted

Automatic operation can be initiated by several types of conventional heat-actuated devices. A simple release mechanism adopted during the tests by Pennsylvania Power & Light employs 5,000-psi explosive valves fired electrically by the closing of a thermostat. These valves, installed on each of the 220-cu ft nitrogen cylinders, are fired simultaneously for pressurizing the individual 350-lb dry chemical tanks with gas. At the same time, a time relay operating an electric release mechanism is activated to open weighted ball valve handles at the discharge outlets of the dry chemical tanks after the nitrogen pressure has built up to a pre-set value.

As an alternate to the electric release, 1-in. bursting disks can be installed at the same discharge outlets to facilitate nitrogen-pressure build-up before discharging. Although it is more costly, the complete electric release mechanism is preferred because of its reliability and the ease with which it may be accurately set over a wide time band

Electrical World Survey of:

HOUSEPOWER

Answers some timely questions on its problems, prospects and plans

Q. What is its current main problem?

A. To get the electrical contractor—The 'Third Man' more into the HOUSEPOWER picture.

Q. What do utilities think of it?

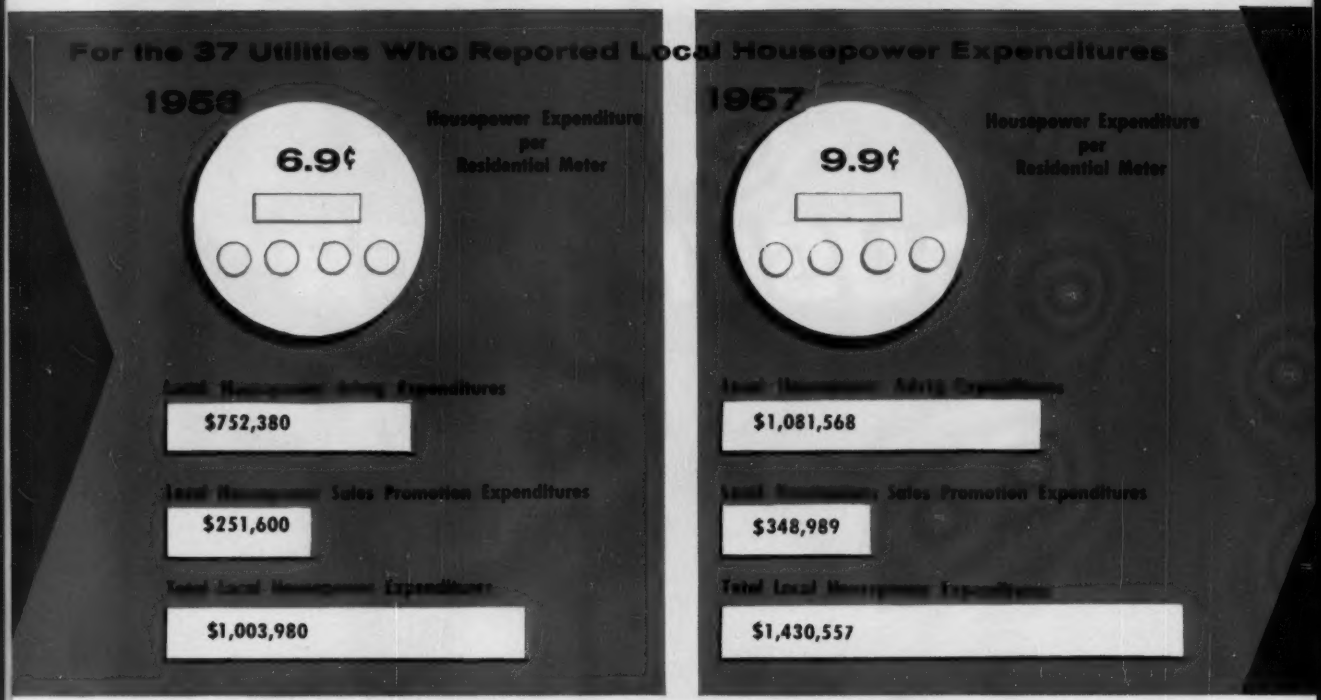
A. They like it. Financial support is good, and most of them effectively use its techniques.

Q. What can utilities do to improve it?

A. They must give the contractor, the vital 'Third Man' standing between them and the customer, more training and more promotional support.

T. R. Jordan
Commercial Editor

For details, turn the page



Local Expenditures Are Going Up . . .

If Electrical World's recent survey of utility Housepower activities reveals one thing, it is this: the two-year old wiring modernization program is definitely here to stay!

Because Housepower without the electrical contractor is like a rifle without a soldier or a loom without a weaver, EW set out to find out whether this key man was as active in the program as he ought to be. If he was, fine. If not, why not? And what could utilities do to activate him?

Preliminary investigation turned up evidence that he was in the program, all right, but not as much as he should be. Said E. O. George, chairman of EEI's Wiring Promotion Committee, "Probably the biggest problem we have today is to get the contractor more into the Housepower program. Without him, it can not do the job for which it was designed. If we knew what the power electric utilities companies were doing to encourage his participation, we'd be in a good position to improve the situation." Hence, the survey—

Of the 57 utilities queried, 51 or a shade under 90% replied. Of this 51, 37 reported their local Housepower expenditures in 1956 and 1957. Their tabulated figures reflect solid utility support of the program. The breakdown on figures is as follows:

- Local advertising monies went from slightly more than $¾ million in '56 to almost $1.1 million in '57.
- Local sales promotion expenditures in '56 stood a shade more than $¼ million; in '57 they were just under $350,000.
- Housepower expenditures per residential meter, based on figures from the 37 reporting companies, averaged 6.9¢ in 1956 and 9.9¢ in 1957. This is a jump of 42.4%.

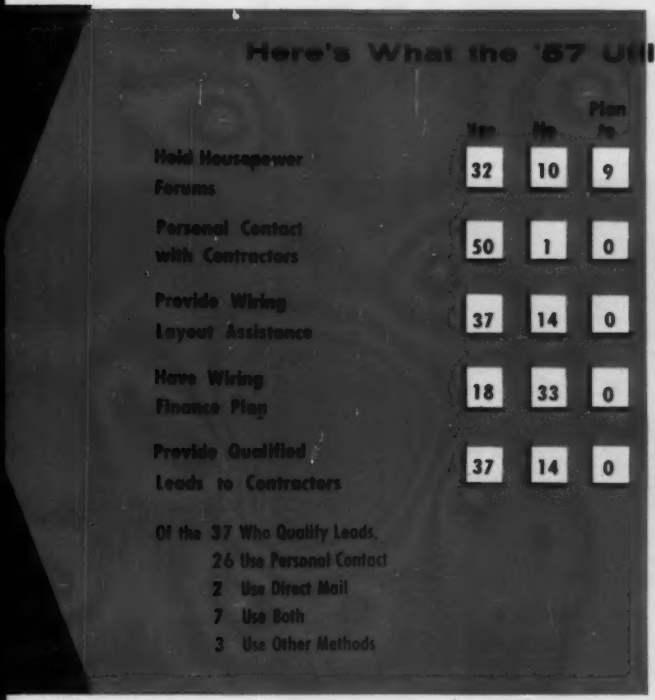
But if the money that electric utilities spent on the rewiring program are encouraging, they do not tell the whole story. Utility methods and techniques also have to be taken into account, and although they are good generally, from a purely statistical viewpoint, they present a picture that is mixed.

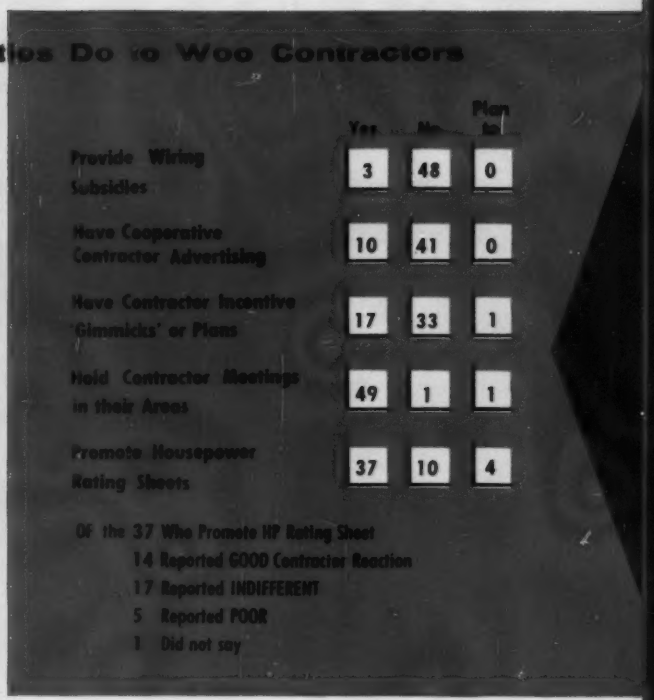
The Housepower Forum has had only fair acceptance. Of the 51 reporting companies, 32 have held at least one, while 11 have not. Nine companies plan to get on the Forum bandwagon. But if all utilities do not hold Forums, practically all have some form of personal contact with the contractors in their areas. Asked whether they did, 49 or 96% replied in the affirmative. Only one does not, and one plans to. But contact planning is sporadic. Only 12 companies contact their contractors regularly, whereas 37 do it intermittantly. Two companies do it both ways.

Wiring layout assistance seems to be a favorite tool. Thirty-seven utilities use this technique; 14 do not. Oddly, no one plans to.

Providing qualified leads to contractors is another popular device, but electric utilities advise caution. It can leave them open to charges of favoritism, so it must be done carefully. Thirty-eight use some means of giving contractors qualified leads. Personal contact is by far the preferred method of qualifying them, although some direct mail is also used.

Wiring finance plans, in which the customer pays





But Methods, Techniques Are Mixed

on a monthly basis-usually on his light bill—are not very popular. (Only 18 companies use it.) Only a few assist the customer to get financing through local agencies. This would seem to show a gap in their practices. If they can help the contractor to help the customer get financing, the job can still be sold with no strain on anyone. The bank or credit supplies the money, which is why it is in business.

Wiring subsidies are virtually unused among the surveyed utilities. This is probably as it should be, because it means that utilities are not buying the wiring, but selling it. Almost 95% (actual number, 48) do not use the subsidy. Some pay a subsidy when new appliances are purchased and installed, but this was not regarded as valid for survey purposes. In order to qualify, the electric utility had to pay the subsidy (in either cash or materials) for a service entrance conversion.

Cooperative advertising doesn't get the play from the electric utilities it would seem to deserve. Ten utilities had cooperative plans; 41 did not. Most prefer to run local ads and encourage contractors to tie-in with them.

Contractor incentive plans or "gimmicks" are also not very popular among the electric utilities. One-third of them use such devices, with the contest-type by far the most frequent.

The survey also queried electric utilities on their attitude toward the Housepower Rating Sheet. Apparently, they like it. Thirty-seven (73%) promote it among contractors, while ten do not. Four plan to. Asked to classify its acceptance on a "good," "indifferent," or "poor" basis, the 37 companies who promote the Rating Sheet produced a mixed, indefinite reaction. Fourteen said the contractor acceptance was good, 17 claimed it indifferent, five indicated poor, and one hasn't promoted it long enough to tell. Biggest single complaint was that contractors are loath to do what little "paper work" is necessary in filling out the form. Because the Rating Sheet is about as simple as it can be made, and still yield useful information, this points up a needed educating job by electric utilities. Contractors will have to be taught how to use the sheet effectively.

Mixed Reaction on Additional Aids

Finally, utilities were asked to indicate what additional promotional aids they would like to see to get the contractors more into Housepower. Most did not answer. Among those who did, there is no recognizable pattern. Requests range all the way from more Housepower Forums to more local advertising materials (such as ad mats) to efforts toward revising electrical-codes.

In the framing of the survey questionnaire, the preparation of mail lists, and other important steps in the completion of this Housepower study, the Editors of Electrical World should like to thank those members of Edison Electric Institute, National Electrical Manufacturers Association, National Electrical Contractors Association, and utility Housepower representatives whose help has made this report possible.

Do You Sell Contractors on these

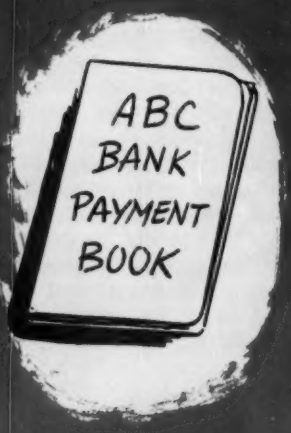
In the Matters of . . .

Subsidies

Utilities shy away from giving wiring subsidies, either in cash or materials. This is to be expected. The power companies must help the electrical contractor sell adequate wiring, but not by buying it from him, which is what they do when they subsidize. Still, the power of the subsidy as a sales tool cannot be discounted. Some method must be devised that will do what subsidies do without their disadvantages.

Cooperative Advertising

Cooperative advertising is a popular and effective tool. It is used consistently by manufacturers to get their dealers to promote their products. There seems little reason to think that the electrical contractor, who in the wiring sense is a dealer, cannot be made to promote Housepower and adequate wiring if his electric utility will give him some paid advertising support. Power companies must give thought to this.



Wiring Finance Plans

Wiring finance plans are also a proved selling tool. Some utilities have arrangements whereby the customer can pay for his service-entrance rewiring on a monthly plan; usually, it's tacked on his light bill. But the better plan seems to be to arrange for financing through a local bank or credit agency. Here the power company has a job to do: it must help the contractor arrange the financing.

Housepower Points?

Contractors are not using Rating Sheets and Estimate-Proposal forms so much as they should. Utilities must help educate them

One serious crimp in Housepower's efforts that has been pointed up in Electrical World's survey is the apparent lack of enthusiasm on the part of contractors for the HOUSEPOWER RATING SHEET and HOUSEPOWER PROPOSAL-ESTIMATE FORMS. More than one returned questionnaire requested that the forms be simplified. Others contained such remarks as "Contractors don't like paper work involved," and "Our contractors don't want to take time, etc."

Are the Forms too Complicated?

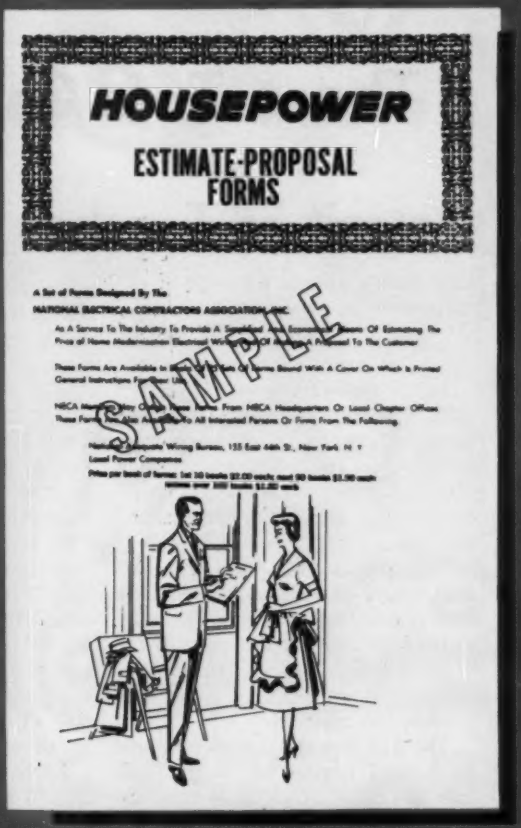
But are the Rating Sheet and the Estimate-Proposal Forms too tough for the contractor to fill out? Do they take too much of his time? No, not according to the experts; that is, if they are to yield any useful information and be a help as rewiring selling tools. Says National Wiring Bureau's Frances Armin, "The Housepower Rating Sheet, and its companion, the Housepower Estimate-Proposal Form are not complicated at all. Yes, they do require time to be filled out, but ask the contractors who have used them properly, and you'll find they think they're a great help."

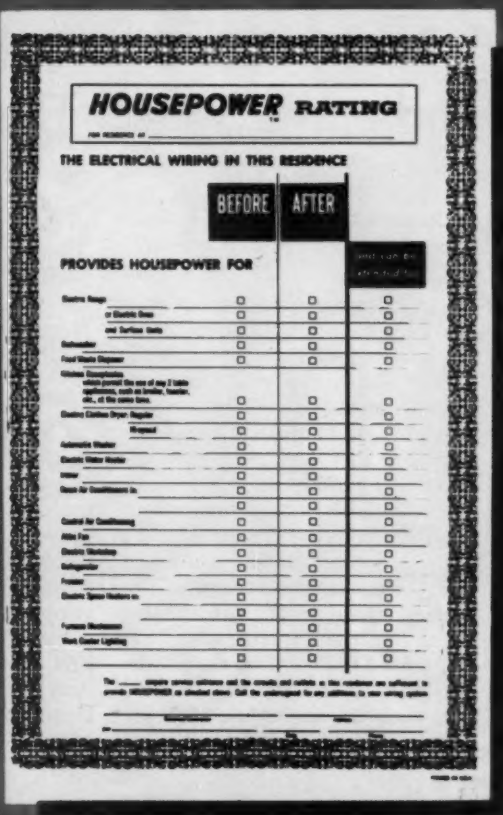
What does all this mean for the electric utility? Most of them (37 out of 51) reported that they promote the forms in their areas, but reaction to them is mixed. The trouble seems to be not in their being too difficult, but in the contractor's lack of "know-how" in using them. And here is where the electric utility has to get into the act.

Utilities Have an Educating Job to Do

If the contractor is ever going to use the Rating Sheet and the Estimate-Proposal Form as it was designed to be used, the utility is going to have to teach him how to do it. Some are already doing it, in their Housepower Forums and other personal contractor contacts, but evidently more action is necessary.

However, they will not have to go it alone. Both EEI's Housepower people and National Wiring Bureau recognize the problem, and educational material is on the way. Instructions on how to use the forms was published recently in NWB's Adequate Wiring Reporter. This material is being made available in reprint form, and can be obtained from the Bureau at nominal charge. It should go a long way in helping to educate the contractors. Some utilities send their wiring men into the field with the contractor. They teach the latter how to use the forms at the same time they are gathering material for another contractor help—the wiring assistance plan. This, by all odds, seems to be the best way to teach the contractor how to use these valuable sales aids.





These Two Case Histories Show How

Detroit Ed Teaches to 'Sell Up'

W. R. MILBY, Assistant Director, Customer Services, Detroit Edison Co, Detroit, Mich.

In the Detroit Edison Co service area, 150 electrical contractors are learning how to sell Housepower. Housepower residential wiring sales training courses are being sponsored by us and contractors share the costs. Each pays $15.

First meeting was held with the contractors to determine their interest. Our men then followed up to see how many would participate.

Detroit Edison furnishes the instructors, arrange the meetings, and provide the materials.

The $15 fees the contractors pay go toward paying the instructors' fees and other expenses in connection with the classes. If a contractor wants visual aid material for his own use, he pays an additional $3.50. Classes are being conducted on a six-week basis. The groups average 20 people per class.

Each class has six sales training sessions and two technical sessions. The Porter Henry Housepower Forum training is given. The contractors go through actual situations as part of the training process. In the sales classes the groups are taught selling generally, not particularly selling wiring. Then they are taught to sell Housepower.

The technical sessions are being taught by technical people. Groups are given information on new materials and methods, codes and how to go about rewiring old homes.

Leads that come in as a result of Detroit Edison's Housepower Services advertising program are being referred to contractors who are taking the sales training program. The sales training is eliminating the practice of "selling down" and cutting prices to get business. Contractors are learning from experience that it is much more important to sell benefits and tell customers what they need and why, than it is to cut the job and the prices to get the business. Contractors are already reporting results. In some of the training sessions they have told how they have sold rewiring jobs despite lower competitor bids.

Direct Mail Follow-up

Detroit Edison is planning to follow up on the sales training program with a direct mail campaign and demonstrations. A 33-ft van-type coach will be equipped for the demonstrations. Contractors share the cost of the mailings and the demonstrations. A mailing piece will go out to an area on a certain day and the demonstration coach

Indiana PS Lets Them Decide

LELAND HOLTMAN, Assistant to the Vice President in Charge of Sales, Public Service Co of Indiana, Plainfield, Ind.

Contractor decisions play a big part in the Housepower training program carried on by Public Service Co of Indiana. The utility decides on the content of the program, but the contractors themselves determine the "how", the "where", and the "when" of it.

Public Service offers the contractors a choice of a three- or six-week course. Almost all groups to date have taken the three-week one. The course, along with considerable selling material the contractors can use, costs $13.50. There are some who take it and do not have to pay, such as employees, city fire inspectors, and representatives of the state fire marshall's office. The company does not limit the course to the previously mentioned groups. Trade allies such as architects, appliance-store salesmen, electrical distributors and REA Co-op employees may also participate.

Uses the Usual Materials

Public Service uses the usual course materials, i.e., the Housepower Forum Kit, Forum Booklets, and related sales and training tools. Emphasis is placed on the Housepower Rating Sheet and the Housepower Estimate-proposal Forms. The company has also developed a piece of its own: a Housepower Certificate of Merit, Materials from National Wiring Bureau, such as the Residential Wiring Handbook, Electrical Symbol Guide, and of course, the Rating Sheets and Estimate-Proposal Forms, are used in the course. They are then given to the contractors for their subsequent use. The utility packages much of this material in a personalized plastic portfolio bearing the "Live Better . . . Electrically" symbol and the individual's name.

At the conclusion of the course, Public Service of Indiana holds a dinner meeting at which it awards completion certificates. Seven courses to date have resulted in 139 certificates out of 144 original registrations. Attendance at all meetings is important. If a man attends only two out of three meetings, we allow the group to decide whether he should get a certificate..

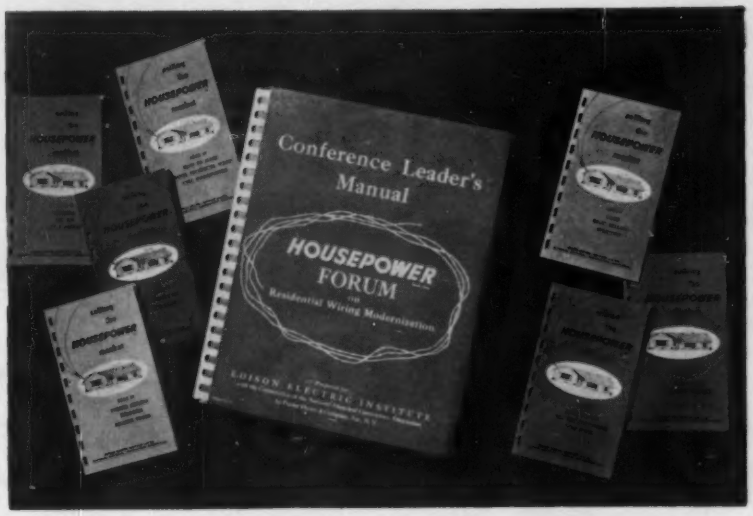
Reaction on our part and the part of the contractors taking the course has been very good. Said one of our utility instructors, "If this course has done nothing else, it has certainly brought us and our contractors much closer together."

Utilities Can Arouse Contractor Interest

will be in the area at that time. On Saturdays the coach is kept in the field so that husbands who are at home can get into see the demonstration.

Plans call for following up the initial classes with other training. Business organization, management and advanced selling will be also taught. The sales training classes will be offered to other contractors who did not take advantage of the first series of classes. Many are already clamoring to get on the bandwagon. They have seen results by the contractors who were trained.

Two meetings of contractors have been held to deal with the problem of financing wiring. Representative bankers attended these meetings to discuss what could be done in the way of financing wiring and how to go about it. These meetings proved very popular; 125 attended the first and 250 the second.



Detroit Edison will also launch an employee wiring financing plan in 1957, using payroll deductions. If an employee asks where to get a contractor he will be referred to one of the 150 contractors who have had the sales training course. When the job is completed, the employee will sign the contractor's invoice, and payroll deductions will begin with his next paycheck.

Said one contractor. "After taking the Housepower Forum course, I was able to sell a better wiring job, and sell it quicker." An example of what the course can do is illustrated by a Terre Haute contractor who sent two salesmen into the field, contacting potential customers on a door-to-door basis. Both had taken the course. In their first week on the road, they sold three residential wiring jobs at a total cost exceeding $800!

Plan to Hold More Forums

Indiana PS plans to hold more Housepower Forums for the rest of 1957. We also plan to extend this fruitful activity into 1958.

The Secretary of the local chapter of National Electrical Contractors Association expressed the opinion "that he and other contractors have been overlooking many opportunities for business in the residential wiring market, and now is the time to make amends."

One representative from the local rural electric cooperative said, "I wish to extend congratulations to you and your organization for doing a splendid job with your Housepower Forum course. I am sure those who attended are now better equipped to better selling jobs on improved or new wiring."

We need no better proof of the value of the Housepower Forum.

NECA's Burnett Gives Contractor Housepower Views

• Thinks more contractors will become active in program when they can be sure of doing house rewiring jobs at a profit. Industrial and commercial wiring woos them away

• Suggests that some kind of 'community' house rewiring organization among local contractors be considered

OLIVER F. BURNETT, President, National Electrical Contractors Association, Washington, D. C.

What can be done to bring the contractor into the Housepower Program? I thought he already was in it.

But if the question is addressed to the problem of getting more and better electrical contractors into selling home electrical modernization and better Housepower for new homes, the answer is quite simple.

Make it possible for him to make a dollar in it!

Although the impression is widely held that electrical contractors are year-round Santa Claus' because they take jobs below cost, the fact remains that the contractor is a business man who must make a profit if he is to do tomorrow's bigger and better jobs.

The simple fact is that housewiring, either in new or old houses, is not, under present conditions, attractive work profitwise to the electrical contractor.

The first reason it is not attractive is that it has to be sold. It is unfortunate that the electrical contractor, due to circumstances far from his own making, is not as a general industry group geared to developing business through the type of sales effort necessary to sell Housepower. He cannot afford out of his present margins to pay the heavy cost of developing the market and preselling it. These margins permit him only to get the business that has been pre-sold.

Housepower Is Doing a Good Pre-selling Job

Today Housepower is approaching that job and doing it superlatively well. More investment and more effort are necessary to make it really do the pre-selling to make the contractor's follow-through effective.

Actually, housewiring takes a better and more resourceful electrical mechanic than the industrial work demands. House wiring is apt to be hard and dirty work, and this does not increase its attractiveness.

And, then too, there are basic management problems that must be overcome to make house wiring popular to the contractor. Contractors are human with all of the frailties of human pride in doing the big, the monumental work which house wiring is not. Many of them shun the attention to detail and supervision that the Housepower contractor must expend.

But all of these roadblocks fade when genuine profit possibilities are presented.

What is needed today is intensive and imperative communication to the electrical contractor that shows him that money can be made in Housepower. Examples must be accurate, factual and not be overstated.

The electric utility should look at this matter more realistically. Some companies lay too much emphasis on power being inexpensive. Many still give lip service to the idea of getting better electrical contractors in the house wiring field, but shunt contracting business to the less qualified people, usually self-employed electricians who will do it cheaper. The manufacturer and the distributor who complain about lack of contractor interest in house wiring are often the ones who sell a builder materials directly at a price lower than they customarily sell to the contractor.

The feeling seems to prevail that the small contractor, particularly the self-employed electrician, is the one upon whom the industry must depend for Housepower. I think that this assumption is faulty.

The Housepower contractor must provide four services. First, he must sell. Second, he must engineer. Third, he must install. Fourth, he must guarantee.

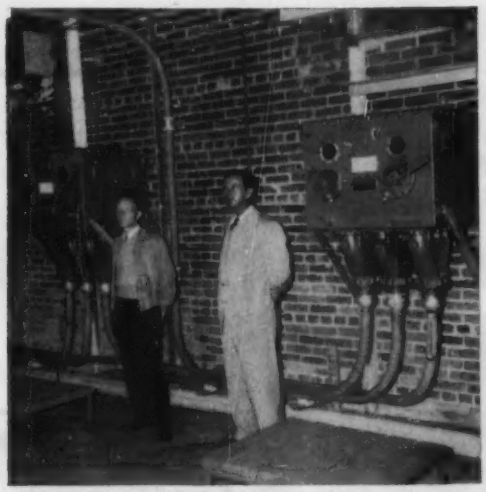
Suppose he is a good salesman. He must spend a fourth to half of his time selling and designing (engineering) the job, which may include arranging customer financing. Suppose he is a fine mechanic and is very productive with the tools. Even so, he would have to be twice as productive as the average journeyman for he would be producing only half the time.

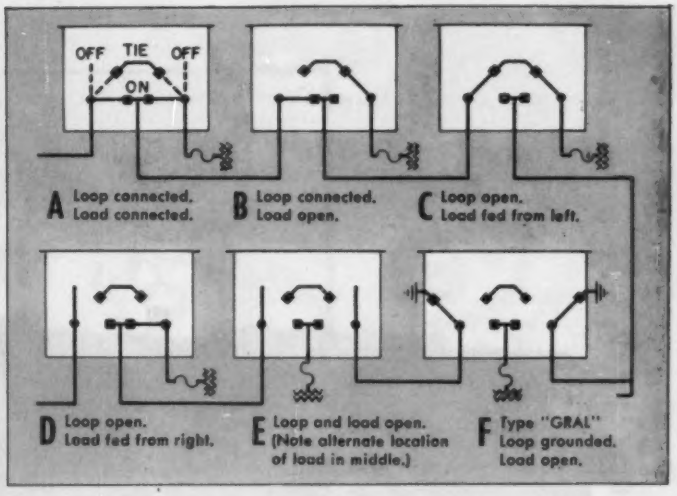
New Type Organization Needed?

I am not sure what type of electrical contracting organization is needed to do this Housepower job.

It may be that in any given community or trade area a common sales organization to sell Housepower needs to be set up with the contractors—large and small—interested in that type of work. Such an arrangement holds promise of a logical and efficient division of labor and skills required. It may be that electrical service centers with contractors holding stock should be devoted to Housepower matters. These would have competent specialized management, workers and equipment.

The matter of getting contractors into the Housepower Program is definitely at the action stage. It is too late to be talking about it.

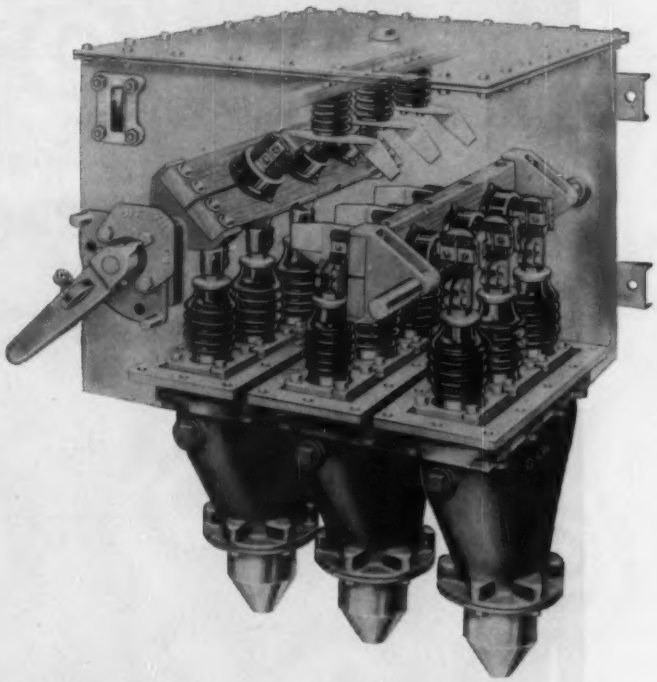



OFF TIE OFF
ON
A Loop connected. Load connected.
B Loop connected. Load open.
C Loop open. Load fed from left.
D Loop open. Load fed from right.
E Loop and load open. (Note alternate location of load in middle.)
F Type "GRAL" Loop grounded. Load open.

Provide distribution system F-L-E-X-I-B-I-L-I-T-Y with G&W Type "RAL" *LOAD BREAK* OIL SWITCHES

Type "RAL" oil switches with three ways (2 feeder and 1 load), two sets of links, and tie buses are designed for use on loop circuits and in other situations where similar flexibility would otherwise require three separate oil switches with correspondingly greater expense for equipment, installation, and space.

The diagrams above show six of the connections possible with the "RAL" switch. The novel link arrangement permits the loop to be connected through the switch with or without the load connected—it permits the load to be connected to either side of the loop with the other side disconnected—and it permits any section of the loop to be isolated (and grounded) without interrupting service to any of the branches. The load cable can be terminated in the middle (either feeder can be grounded) or in either of the outer cableheads (load can be disconnected without interrupting loop).



Standard "RAL" switches are made in 400 ampere (full load break) rated 600, 7,500 & 15,000 (illustrated) volts. Special designs for 23,000 and 34,500 volts and for 1000 amperes.

Send for series "D" bulletins.

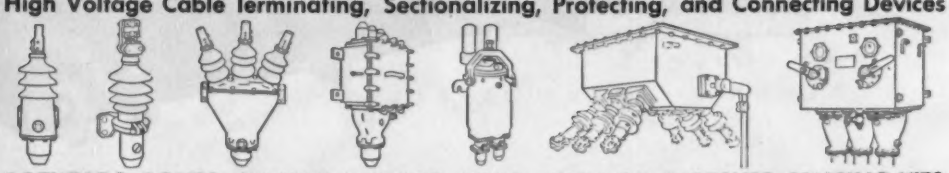
Type "RAL" switches are combined into special units with "FC" OIL FUSE CUTOUTS or with POWER FUSES to save equipment cost, installation labor, and space.

G&W ELECTRIC SPECIALTY COMPANY
3500 W. 127th ST., BLUE ISLAND, ILLINOIS

Representatives in many cities of U. S. A., N. & S. America Canadian Mfr. – Powerlite Devices, Ltd., Toronto, Montreal & Vancouver D571

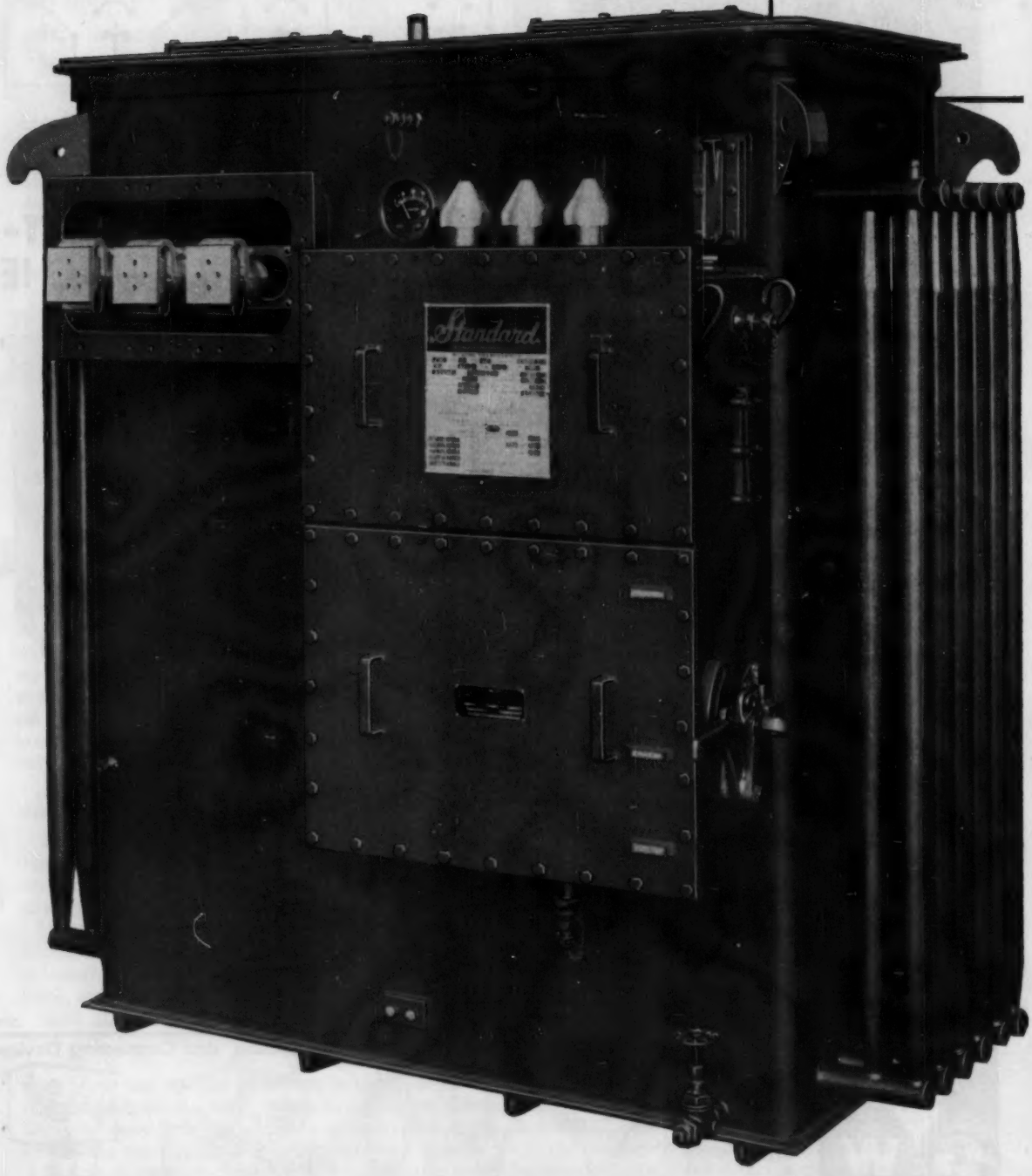
G&W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices



POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS

We



squeezed it in

● We squeezed this 750 KVA, oil-filled, network transformer into an existing vault 53″ x 74½″ x 78″. We did it by mounting the primary switch and protector-type throat on one side instead of at opposite ends. This modification didn't cost a penny extra—that's normal Standard service in transformer design. Extra service and extra performance go with every Standard Transformer, yet these exceptionally rugged units cost no more than repetitive models. Your nearby Standard representative can show you why your next transformers should be Standard. See him before you ask for your next bids.

He sees every turn . . .
knows the number of turns is right . . .
holds noise levels down by keeping turns tight.
There's less chance for error with this close,
personal attention to detail.

LIVE BETTER ELECTRICALLY

Standard Transformer CO.

WARREN, OHIO

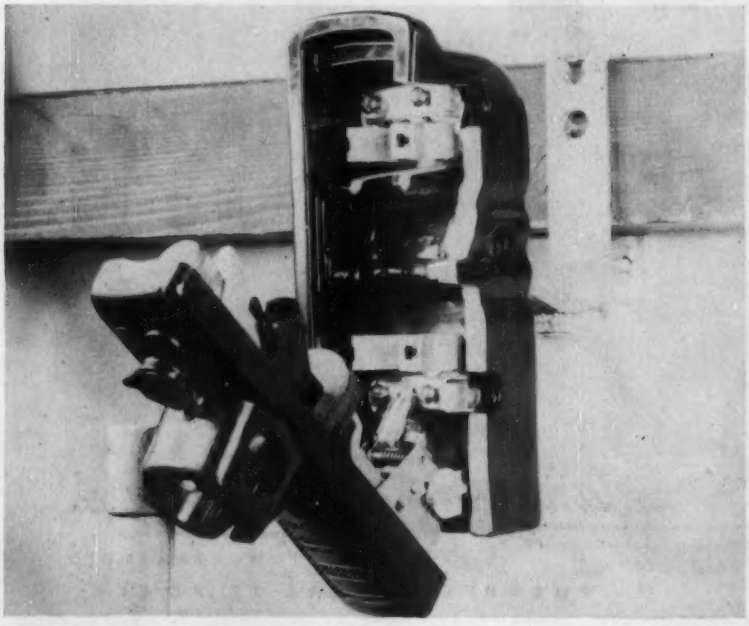
WHEREVER THERE IS POWER

TODAY'S DESIGN TRENDS

Gas Cylinder Is Used in Cutout to Break Load

F. J. CHAREWICZ, and R. E. KOCH, Engineers, Lightning Arrester and Cutout Engineering Section, Distribution Transformer Department, General Electric Co, Pittsfield, Mass.

GAS CYLINDER can be inserted in cutout door by a lineman. The cylinder is filled with compressed gas for cooling and deionizing the arc automatically



CUTOUT is shown partly opened. As door opens further, arc drawn from lower contact to cylinder burns off tip, releasing gas. Cutaway shows the contact

A small gas cylinder now provides full-load switching with General Electric Co's new 100-amp enclosed cutout. A lineman merely inserts the cylinder into a holder on the cutout door. With the device in place, the cutouts can switch load currents up to the full rating of either the fuseholder or the disconnect blade cutouts.

The new load-break feature on enclosed cutouts enables utilities to provide for load switching at all cutout locations. It functions as a load-break device when the cutout door is pulled open with a switch stick in the usual manner and does not interfere with the cutout's normal operation as a fused overcurrent protective device.

Mounted on the cutout door, the device is easily accessible for replacement and inspection. The gas cylinder is small enough to fit into the cutout without affecting the cutout's strike or creep distances.

The loadbreak operates on the principle of cooling and deionizing the arc by means of compressed gas stored in a small Monel cylinder. When the cutout door is closed, the cylinder contacts the lower terminal first. No current is drawn through the cylinder, as the lower line contacts are closed—shorting out the cylinder—before the upper contacts mate.

Opening of the door draws an arc between the top contacts, followed by an arc between the lower terminal and the special tip of the gas cylinder. The latter arc burns through the tip to release the compressed gas which blows out the arc.

Interrupting tests covered the current range from minimum transformer magnetizing current to the

(*Continued on page* 76)

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES

Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud for Sectional Ground Rods

Type GG
Ground Rod Clamp
Socket set screw

Copper Alloy Coupling for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

Available Through Electrical Wholesalers Everywhere

DISTRIBUTED ON THE WEST COAST BY
KORTICK MFG. CO.

JASPER BLACKBURN CORPORATION
1525 Woodson Rd., St. Louis 14, Mo.,
Wydown 3-9430

Used in Cutout

(*Continued from page 74*)

full-load current rating of the cutout. Power factor was varied from 0 to 80% inductive (lagging pf). Switching tests were made at cutout rated voltages of 5,000 and 7,500 v.

Arcing duration at full-load currents, on either the fuseholder or disconnect blade door, was only 3 to 7 cycles, current interruption occurring before the cutout door was completely open. Arcing at medium currents was hardly noticeable.

A non-tracking butyl rubber arc-insulating barrier on the lower box terminal prevents re-strike to the metallic door parts after the gas cylinder has cleared the circuit. Monel was selected for the cylinders for its superior resistance to corrosive atmospheres.

When distribution voltages were lower and loads lighter, linemen switched section lines and equipment by yanking open the cutout door, hoping to part the contacts near current zero. When the arc persisted, the lineman could only close the cutout as quickly as possible to minimize burning. When he opened near current zero, the arc might go out, and only his speed could prevent re-strike. Increased loads have made this practice more difficult and highly undesirable.

When rigid safety regulations are followed, load switching must be done either by expensive air break or oil switches or by going back to the station breakers and disconnecting an entire system before opening the cutout.

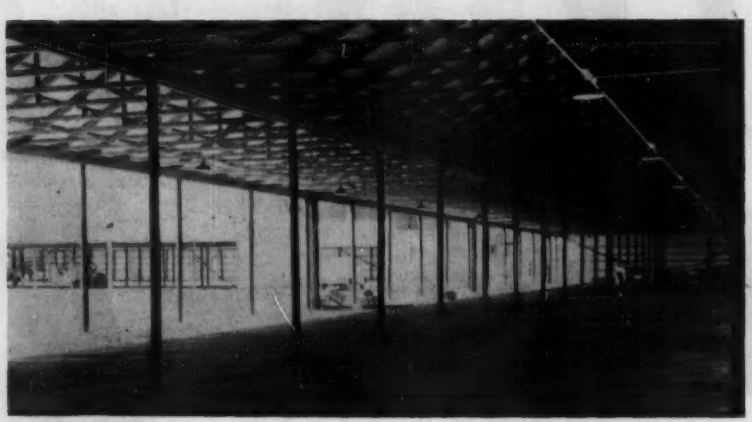
The latter operation requires precise timing by telephone or two-way radio; it always involves interrupting service on more parts of the system than the branch or feeder being worked on. The new device provides a means of switching distribution system load currents efficiently at each cutout installation.

DISTRIBUTION—Construction

Pole-Type Vehicle Shed Cuts Building Costs

F. L. KLINE, Special Representative, Iowa Power & Light Co, Des Moines, Iowa

MOTORIZED EQUIPMENT is stored compactly in four pole-type sheds which protect vehicles from inclement weather, enabling them to start fast in emergencies

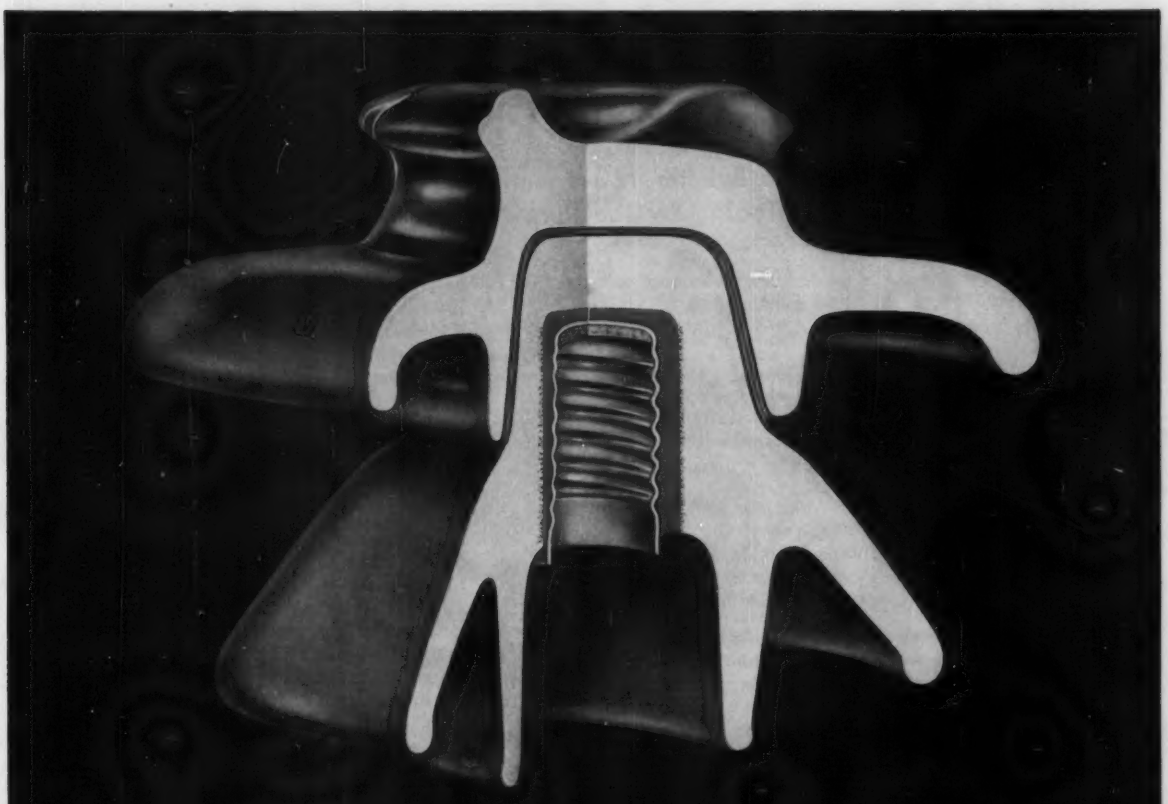


POLE STRUCTURES, built at a cost of less than $1 per sq ft, can house the largest of Iowa Power & Light Co vehicles. Shed area totals 30,000 sq ft

Four pole-type sheds protect Iowa Power & Light Co motorized equipment from inclement weather and assure faster starts in emergencies. Some 50% of the usual construction costs were saved by substituting the sturdy pole-type shelters for the more conventional kinds.

The pole-type structures were erected more speedily than conventional shelters and without use of high-priced skilled labor. They require no excavation, concrete foundations and footings, mortising or notching, nor is there any need for expensive scaffolding or bracing. They were built at a cost of less than $1 per sq ft. Yet these buildings, whether open or enclosed, are of such simple design that they are pleasing to the eye and are easily expanded or remodeled.

The pressure-creosoted poles are protected against decay and termites. The 187 pine poles, mostly 16 ft long and 5 in. in dia, were set 4 ft in the ground. Corner poles have an inch larger diameter, and interior poles, carrying the timber roof trusses, are about 18 ft long. The spaces between opposite sides of the sheds are 20 and 25 ft wide. Two wider sheds, each divided into two sections, have an additional row of poles down the center.



CUT-AWAY VIEW OF VICTOR NO. 233-R (EEI-NEMA 56-2) HIGH VOLTAGE RADIO-FREED PINTYPE INSULATOR

VICTOR HIGH VOLTAGE PINTYPES COST NO MORE THAN ORDINARY INSULATORS!

VICTOR High Voltage Pintypes are the industry's greatest value! Only with VICTOR do you get premium quality insulators without paying premium prices.

These insulators are laboratory designed, manufactured and tested with the industry's most modern equipment. They are made of VICTOR *Purified* Porcelain—finest insulator porcelain ever made. They are *precision* made. Shells are accurately aligned. Machine-spun zinc thimble assures perfect pin fit. VICTOR'S radio treatment, *distinguishable* and *permanent*, eliminates your radio interference problems.

Scientifically fitted glaze gives added strength and added protection against contamination. Beaded edges give higher impact strength. Each insulator is designed to withstand steep front impulse waves in addition to the normal 1.5 x 40 standard impulse wave. Full size, smooth top and side grooves insure proper conductor seating. When you buy VICTOR, you just can't buy better high voltage pintypes—at *any* price!

Nothing beats Porcelain **FOR ELECTRICAL INSULATORS!**

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC. • VICTOR, N.Y.

Line Maintenance Tools: Protection and Care

An adaptation from Bulletin 160-4, entitled "Protection and Care of Line Maintenance Tools," by the Rural Electrification Administration

I. Purpose. To provide a guide for establishing adequate programs for the care and maintenance of maintenance tools used on electric lines.

II. General. Establishment and maintenance of safe working conditions on electric lines are management responsibilities. Maintenance schedules and frequency of inspections vary and depend on climatic conditions, severity of usage, and work habits of the user.

III. Care and Maintenance. Workmen should be thoroughly instructed in the following care and maintenance of tools, and regulations should provide for such requirements. Manufacturer's maintenance recommendations should be used to supplement these instructions.

A. Grounding Devices. These devices are used to protect the lineman working on cold lines which might accidentally become energized. The grounding set usually consists of three hot-line clamps, each assembled to individual leads which join a common lead connecting to another clamp. Latter clamp is attached to the system neutral or to a ground wire or rod.

1. Precautions should be taken during transport and storage to avoid injury to the leads or clamps.

2. Dry storage should be provided to avoid corrosive effects on lines and lamps.

3. Clamps should work freely and easily at all times.

4. Grounding set should receive the same care in maintenance and storage as hot-line tools.

B. Cold Line and Ground Tools

1. All tools should be kept clean. Tools exposed to damp soil and moisture are liable to rotting of wooden parts and to rusting which dulls metal cutting edges and roughens smooth surfaces. It is essential that tools be dried, after using all dirt and rust removed with a wire brush, and the cleaned surfaces wiped with an oily rag.

2. Cutting edges of tools should be kept sharp. After sharpening they should be protected by sheaths, and transported or stored to prevent them knocking against other tools and equipment. Pike poles should have pike guards or reversible pikes.

3. Individual racks or storage compartments should be provided on trucks and in storage rooms for such items as saws, digging tools, axes, pike poles, tree trimmers, and similar tools.

4. Wooden handles become rough, splintery, and dangerous to handle when long exposed to the weather. Wooden handles should be kept clean and dry by proper storage when not in use and by proper care after using. Occasional sanding and coating of handles with linseed oil will prolong the life of the wood and improve working handling of the tool. Split or broken handles should be replaced and loose handles tightened.

5. Tools should not be thrown from the working position to ground or from ground to the working position. A canvas tool bag or other insulated container, attached to dry hand lines, should be used to raise and lower tools to the working position.

6. Lubrication of working parts of such tools as pliers, wrenches, pruners, etc., will make the tools easier to operate and will prevent rust from damaging the equipment.

7. Leather equipment, such as the lineman's tool and safety belt, is usually cared for by the user. Wet leather should be wiped and then dried slowly at room temperature. Mineral oil, acid, and grime should be removed immediately with saddle soap, followed by an application of neatsfoot oil to preserve the leather. Periodic cleaning of leather with saddle soap followed by neatsfoot oil, rubbed in, will help preserve leather.

8. Linemen's climbers or hooks should be kept sharp and of required length in accordance with recommended safety practices. Leather and metal fasteners and supports should be maintained in top working condition and any worn or damaged parts repaired or replaced.

IV. Inspection and Replacement. Management should establish adequate, periodic inspections of tools as a requisite of a good maintenance program. Definite responsibility for inspections should be placed on the foreman, line superintendent or other capable individual. Written records of inspections should be kept, showing dates, results and action taken.

A. Grounding Sets. These sets should be inspected periodically for good working conditions, whether they have or have not been used.

1. The sets should be inspected before taken out on the line for use. After use, they should be inspected, cleaned and dried before storing.

2. All inspections should be recorded, with deficiencies noted.

3. Frayed or broken conductors should be replaced.

4. Broken clamps should be replaced. If a clamp cannot be adjusted to work freely, it should be replaced. Replacement clamps and lines should be carried in stock.

B. Cold Line and Ground Tools:

1. The line superintendent or foreman should have the responsibility of inspections. He may appoint another individual to do the inspecting.

2. All tools should have frequent and regular inspections for safe and efficient operating conditions.

3. Tools should be inspected prior to any especially hazardous or difficult job.

4. Tools should be inspected after especially severe usage.

5. Field inspection of tools should be made prior to starting a job.

6. Hand tools, safety belts, and climbers should be thoroughly inspected at frequent intervals, the frequency depending on local conditions.

7. All tools found to be defective should be marked and returned to the tool room for repairs or scrapping.

Shown here, inspecting Kansas City Power & Light's new Mobile units are, left to right: I. C. McLain, RT&E representative; R. L. Wright, E. D. Church and F. D. Cochran of Kansas City Power & Light.

KANSAS CITY POWER & LIGHT MAINTAINS SERVICE WITH RT&E EQUIPPED MOBILE UNITS

When necessary repairs must be made to Kansas City Power & Light's line installations, there's no shut-down on power to customers. Mobile substations like these are wheeled into action, taking over the transformer job while replacement or repairs are made on line units. Service is maintained without interruption.

The heart of these mobile substations depends on versatile RT&E DUAL VOLTAGE TRANSFORMERS . . . rated at 100KVA, 2400x7620 — 120/240/277 volts with *Externally Operated Taps* at 8000/7810/7430/7200 volts. These special units also incorporate RT&E's *Externally Operated primary voltage change-over switch.*

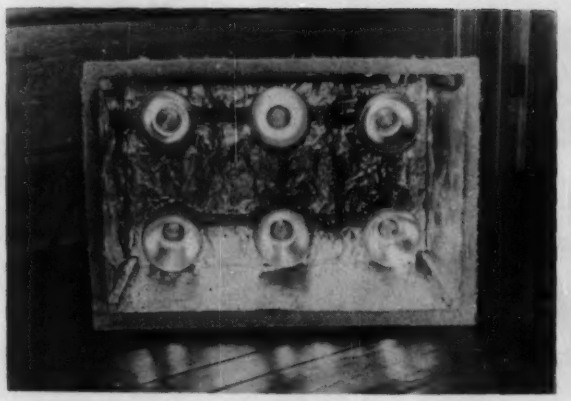
This is just another example of RT&E transformers at work, proving again their merits with many of the industry's outstanding and exclusive features.

EXCLUSIVE WOUND CORE
"WEATHER PROTECTED" DESIGN
EXTERNALLY OPERATED CHANGE-OVER SWITCH
EXTERNALLY OPERATED TAPS
FIVE YEAR GUARANTEE

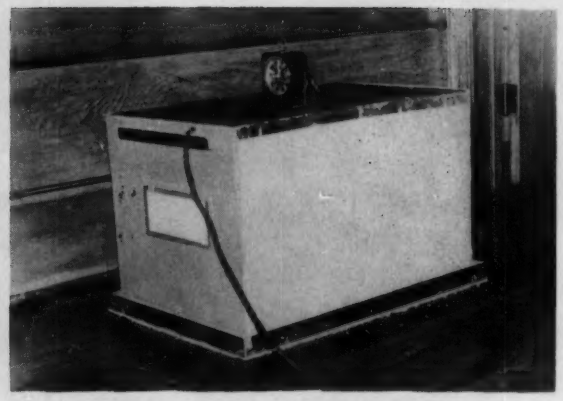
Ask your RT&E representative to demonstrate the five sound reasons why RT&E transformers are better. Or write RT&E Corporation, Waukesha, Wisconsin.

RT&E CORPORATION WAUKESHA, WISCONSIN

HELPING PROVIDE POWER FOR AMERICA



1.5 Kw of infra-red lamps . . .



when placed on hardwood flooring . . .

Kills Beetles and Termites in 5-10 Minutes

Use of infrared lamps for the destruction of Lyctus beetles in hardwood floors has been developed by a researcher at University of California at Los Angeles. Field trials have demonstrated that the 1.5-kw unit will kill adult beetles, larvae and eggs in 5-10 min, depending on the floor thickness and relative humidity. Roy J. Pence, UCLA Dept of Entomology, who developed the unit, adds that it also is effective on certain types of termites, but only in hardwood floors.

The pilot model is a light wooden cabinet measuring 18x26x16½ in. It holds six standard 250-w, R-40 lamps with skirted base. An aluminum foil lining provides both a reflective surface and insulation for the cabinet. The unit is slid from one floor area to another.

Exposure times for a complete kill are about 5 min for ⅜-in. hardwood flooring, 7 min for ½-in., and 10 min for 13/16-in. Because moist heat is a better killing agent than dry heat, the unit works more rapidly in humid climates. As the unit will draw 1.5 kw, the developer recommends that no more than one be operated in a home at one time.

Exposure time no longer than necessary will not darken flooring, nor harm wax or shellac finishes, reports Pence. The device is not recommended for varnished floors in areas of high humidity unless refinishing is contemplated. As varnish is a seal, internal vapors created by the heat may cause blistering of surface finishes.

Though the unit was specifically designed to combat Lyctus beetles in flooring, it also is effective on certain varieties of termites. This is an incidental value, however, and the device is useless for termite control other than in hardwood floors. A commercial model is planned by a Los Angeles manufacturer.

See Electronic Ranges at ¼ Million Yearly by '65

At least a quarter of a million American housewives a year will be switching to microwave cooking by 1965, if the predictions made recently by one range manufacturing executive hold true.

In testimony before the Federal Communications Commission, Dr. I. A. Getting, Raytheon Mfg Co vice president, said that his company expects that at least 250,000 units a year to be sold at about half of today's price. Quote Getting: "Our market analysts anticipate that by 1965 there will be in excess of 250,000 units a year sold at an average selling price at the consumer level of $600 each, or a total of $15 million a year. These estimates assume that mass production techniques will make it possible to reduce the consumer price to the $600 figure from the present consumer price of approximately $1,200."

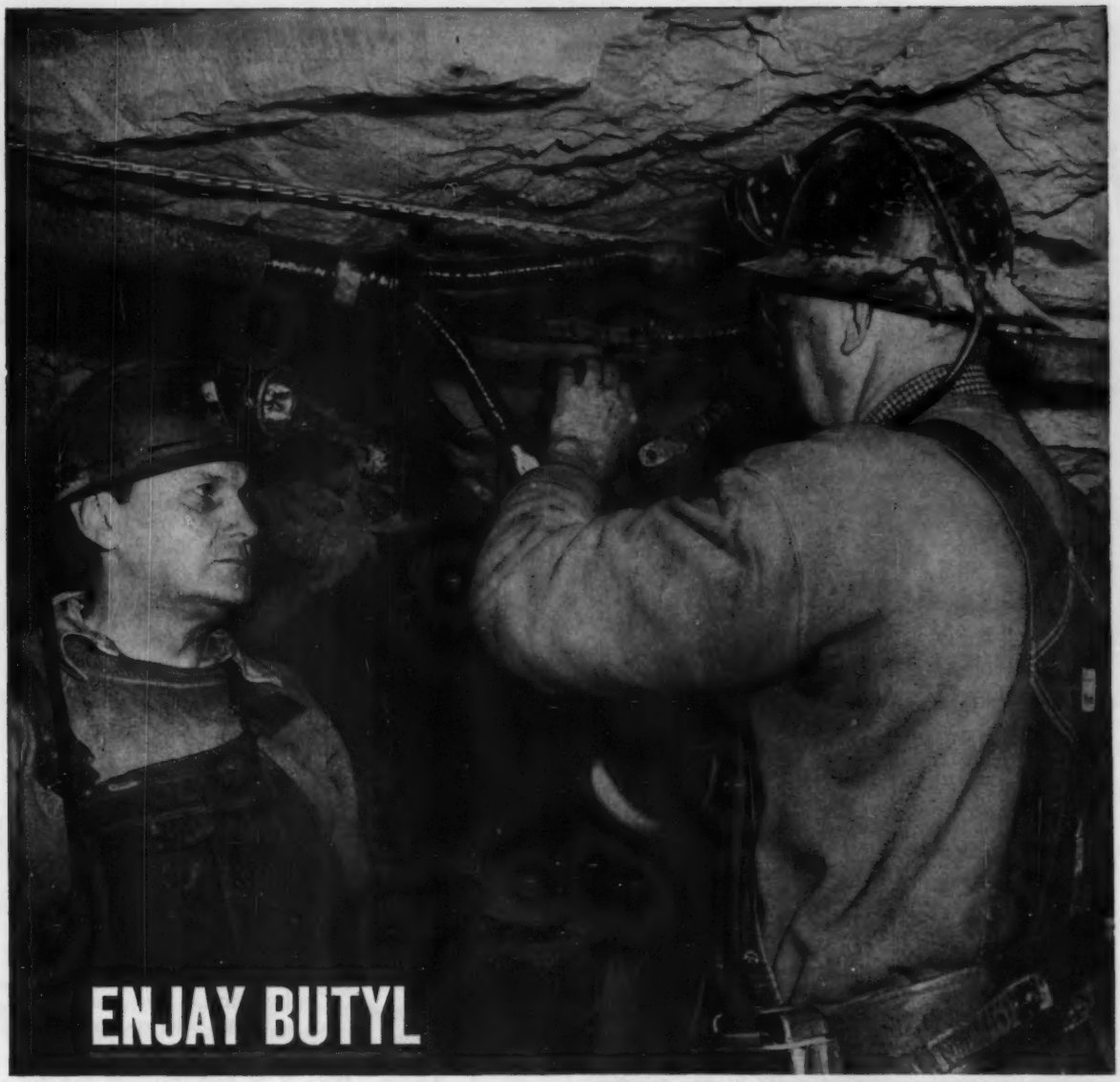
Getting made his remarks in connection with Raytheon's urging the FCC to retain the current ISM (industrial, scientific and medical) microwave frequencies.

Raytheon, which has been in the microwave cooking business for 10 years, feels that the best frequencies for electronic ranges is in the 2,400-2,500 Mc band width.

Heat Water Now, Pay Later

Hot water on the installment plan is the latest service offered by Washington Water Power Co. Now all classes of WWP customers can finance purchases and installation of water heaters over a 36-month period. New or replacement heaters that comply with the firm's existing water heater specifications may be financed up to $350. No down payment is necessary. Monthly payments on heater purchase and installation costs will be added to the customer's electric bill. Minimum monthly payment is $3.00.

(*More Selling on page* 82)



electrical wonder rubber OFFERS TRIPLE VALUE

Performance! Versatility! Economy! In all three, Enjay Butyl is the world's outstanding rubber value. In laboratory tests, and a wide variety of applications, no other rubber has matched Enjay Butyl's ability to resist ozone and corona, impact and abrasion, moisture and weathering . . . properties that make Enjay Butyl-made products *outstanding* performers.

Underground service cables, transformer housings, high-voltage industrial cables . . . in these, and many other electrical applications, Enjay Butyl outperforms and out-lasts *all other* types of rubber, synthetic *or* natural. *Low-in-cost* and *immediately available*, this truly wonder rubber may well be able to cut costs and improve performance in *your* products. For further information, and for expert technical assistance, contact the Enjay Company.

ENJAY

Pioneer in Petrochemicals

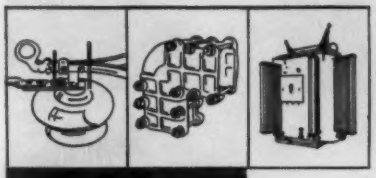
ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Akron • Boston • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

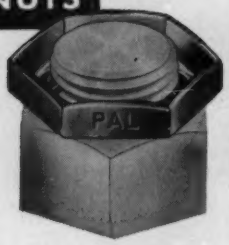
ENJAY BUTYL

Enjay Butyl is the greatest rubber value in the world . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

Keep Nuts Tight
on all bolted assemblies



Apply
PALNUT
LOCK NUTS

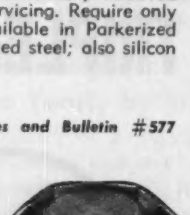


PALNUT Lock Nuts apply so fast, lock so dependably . . . you can specify them for every nut-and-bolt assembly, at negligible cost. Maintenance is reduced on mechanical assemblies — full conductivity assured on electrical connections.

PALNUT Lock Nuts may be used on new or existing equipment. Easily removed and re-used when servicing. Require only 3 bolt threads. Available in Parkerized and hot dip galvanized steel; also silicon bronze.

Send for free samples and Bulletin #577

THE PALNUT COMPANY
51 Glen Road
Mountainside, N. J.



PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

Indiana Co-ops Warm on Electric Heat

Survey reveals Hoosier REMC managers think electric heat a needed consumer service, but feel that 'rate is everything'

What do rural electric membership corporations think of electric house heating? If a recent survey of REMC managers in Indiana, published in the July, 1957 issue of the Department of Agriculture's "Rural Lines," is any indication, they think it's (1) a good load builder; (2) an inevitable part of the residential load; (3) a real service to co-op members; and (4) a load balancer for farm loads which peak in other seasons.

Managers report they were forced into the electric heat business even before its feasibility was established. Indiana has about 150,000 farms, 97% of which are electrified. Statewide discussion of the subject began in 1951; the first promotion followed later that year.

The co-ops are promoting heating all year 'round. Housing starts in spring usually spur interest, as does cool fall weather. Promotion centers around convenience, safety, comfort, cleanliness and installation-cost savings.

Rate is Biggest Factor

The biggest factor, however, are rates. According to most managers, "2¢ competes, but 1½¢ converts." "The rate," they say, "is everything."

They also stress the importance of advisory service to the customer during planning and installation. Wiring, insulation requirements, and other factors affecting performance and operating costs are outlined to both the consumer and allied tradesmen. Some co-ops inspect the job before they will allow it on their lines. The managers feel this leads to fewer complaints and greater member satisfaction.

Nearly all heating installations on the Indiana co-ops' lines are separately metered in determine cost, kwhr consumption and revenues. Demand meters are commonly used to measure effects on system characteristics.

Installed capacity averages 8 to 15 kw. Managers find that although kwhr usage is high, the load at any particular time of day is moderate compared with other high-wattage appliances.

Managers like the load, but advise that the following questions be answered before promotion is undertaken:

- How low a rate is needed to get the business?
- What does it cost to furnish service?
- What types of equipment fit the system's load characteristics best?
- What other uses maintain balance in the yearly load curve?

Most co-op people surveyed think electric heating is here to stay. "Electric heating is here; we'd better promote it and control it," is the general opinion.

H & C BRIEFS

N. Y. C. Hotel A. C. Doubles

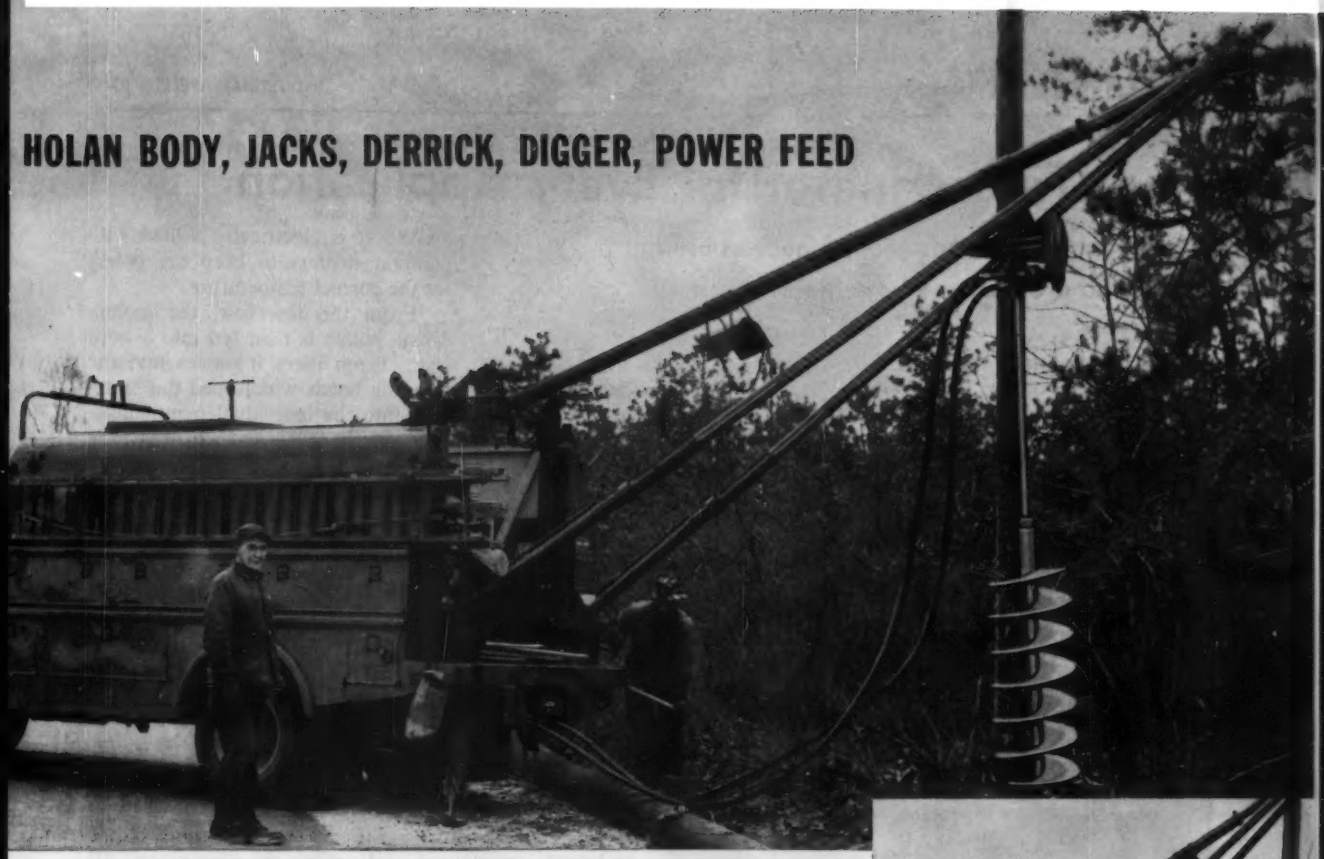
Cool comfort is now available in twice as many hotel rooms in New York City now than at this time last year. Over 25,000 rooms are now air-conditioned in the 165 member hotels of Hotel Association of New York City, Inc, reported James A. McCarthy, executive vice president. Some 15 hotels are completely air-conditioned with many others having a large number of rooms similarly cooled.

Employees to Benefit

Distributors, dealers, and employees of Carrier Corp, Syracuse, N. Y., are being offered the company's air conditioning units for their own use at a special low price. Carrier hopes air conditioning in employees' homes will stimulate purchases by their neighbors.

(*More Selling on page* 84)

HOLAN BODY, JACKS, DERRICK, DIGGER, POWER FEED



Dig the hole . . . set the pole

The photos tell the story. This crew is equipped to handle just about any job you give it.

Body: Holan's CHC-182—big enough to carry everything and everybody you need. A 7-man crew compartment plus the usual Holan features such as high-tensile steel throughout, double-panel doors, indented compartment handles and large inside dimensions.

Jacks: Fast-acting, self-stowing, Holan hydraulic jacks move from stowed position to full extension in 8 seconds . . . return in 6 seconds.

Derrick: Holan Series 5700—a live-boom unit with hydraulic sleeve locking for side legs. 6,000-pound capacity . . . 2,000 pounds for loading into truck.

Digger: Holan 4401-H hydraulic earth borer takes the hard work out of hole-digging. Goes down smoothly, pulls up easily, shimmies off dirt.

Power Feed: New bracket-type unit fits onto middle leg . . . uses hydraulic force and weight of derrick to force digger into hard ground . . . holds digger while derrick sets pole.

In other words, whatever you need in bodies and power equipment, you can get from one source: *Holan.* Everything is made of high-tensile steel, everything is a step ahead of the field. Write for catalogs on Holan equipment.

Holan digger shimmies off dirt. Notice digger power feed and sleeve locks on derrick side legs.

Holan power feed attachments can be mounted on Series 3700 or 5700 derricks. 3700, shown here, has 12,000-pound capacity . . . has been load-tested at 22,000 pounds.

J.H. HOLAN® CORPORATION

4100 WEST 150TH STREET
CLEVELAND 11, OHIO

OTHER PLANTS
HOLAN CORPORATION OF GEORGIA, Griffin, Ga. • J. H. HOLAN CORP., Phoenix Div., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

Plant Finds Heater for Every Application

Electric cable, strip, and tubular heaters used in automated production in shoe polish plant.

GEORGE C. WAGNER, Industrial Power Engineer, Union Electric Co, St. Louis, Missouri

Three different types of electric heaters are used to simplify handling and maintain a good product consistency in the manufacture of shoe polish at the Barton Manufacturing Co plant, St. Louis, Mo. This plant produces Dynashine polish both in paste and liquid forms.

After the paste polish has been formulated, it is pumped from the mixing room to the production line. To keep the material at the proper fluidity, the pipelines which carry the molten paste polish to the automated production line are heated with electric soil heating cable.

The pipeline terminates in a reservoir at the canning machine. This reservoir is electrically heated with tubular heaters to keep the polish at the correct temperature.

From the reservoir, the molten paste polish is then fed into a hopper. From there it passes into the loading heads which feed the material into the individual merchandising containers and meters the amount going through. Each of these loading heads has an electric strip heater to maintain a good consistency for easy feeding. Total connected load of the three types of heaters in the shoe polish plant is about 10 kw.

INDUSTRIAL NEWS NOTES

Aluminum Structure Substation Installed at Kaiser Plant

The entire structure of the new unit substation shown at left is constructed of light weight aluminum. All structural members were prefabricated. Because of the light weight, only two men were needed to erect the structure.

The custom built, outdoor substation is rated at 20,000 kilovolt amperes. The electrical equipment includes two, self-cooled power transformers, rated 7,500/9,375 kva, 32,800 volts, 3-phase, 60-cps. The compact design of the new unit substation has made additional parking space available for the extrusion plant's employees.

INDUSTRIAL BRIEFS

Converted Crane Ends Production Breaks

GLEN J. ALDEN, Industrial Sales Engineer, Minnesota Power & Light Co, Duluth, Minn.

Converting an electromagnetic crane from gas engine to electric drive put an end to production interruptions at Priola & Johnson, Duluth, Minn. metal reclaiming firm. The crane picks up metal fines from the crushed slag from a nearby steel mill and dumps them on a conveyor belt. The fines then go to a screening and magnetic separation plant. The new electric motor is a 55-hp unit. The 100-hp gas engine it replaced was continually breaking down, holding up production.

Immersion Units Make Mill Fat Flow Faster

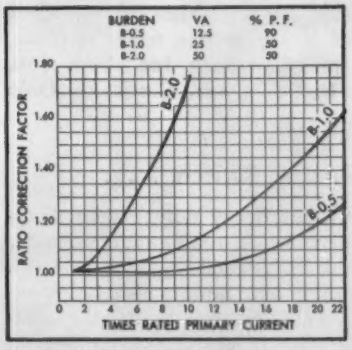
CHARLES C. MILLAR, Power Sales Engineer, Pennsylvania Power & Light Co, Wilkes-Barre, Pa.

Two 4-kw immersion heaters installed to melt drums of animal fat and tallow used in mixing animal feeds have increased production and cut labor costs at the Pike County Feed & Supply Co, Lackawaxen, Pa. The "over-the-side" oil immersion heaters are installed directly in the 50-gallon steel drums in which the material is received. The drums are set on an elevated platform near the mixing machine so the liquified fats can be run directly into the mixer as required. Heaters are operated from a 240-volt line.

Previously, the animal fat was heated to the proper consistency in kettles on a gas-fired burner. This was a slow, messy process which limited fat production.

NEW 5-Kv Molded CURRENT TRANSFORMER

...for Indicating and Tripping Service



Typical 60-cycle overcurrent curves for Type LRM current transformer.

Extends Line of Maintenance-free Epoxy-resin Units

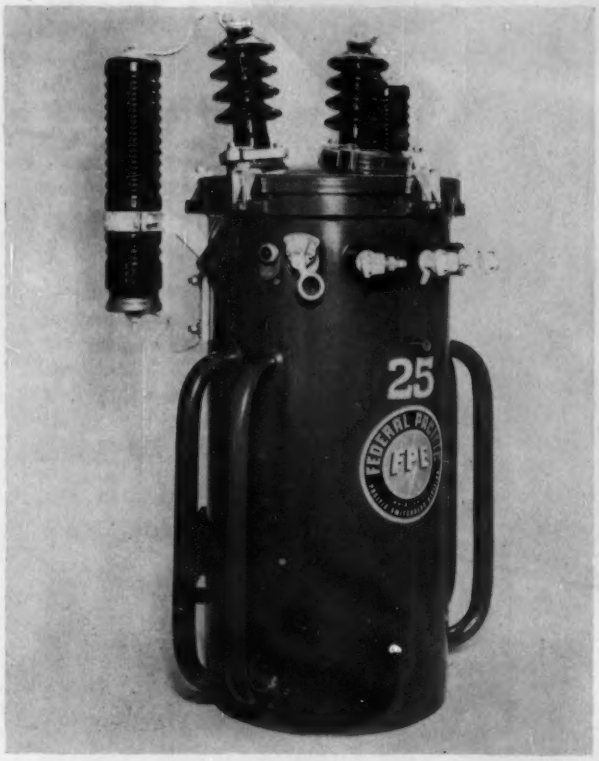
Latest in a growing family of molded units, this Type LRM current transformer rated 5 kv is already a prime favorite with panel and switchgear designers. Molded of epoxy resin, this new transformer is virtually maintenance-free. It has high impact strength . . . resists mechanical forces, moisture and fire. These advantages at no extra cost.

All units are supplied with a short-circuiting strap, removable after installation. Base design permits mounting anywhere—on walls, bars, channels, etc.

Allis-Chalmers instrument transformers are available in the widest possible rating range. Many are molded units. Other epoxy-resin designs are in pilot production. For complete information, see your A-C representative, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5503



Distribution Transformer . . .

. . . providing full current protection for ratings from 10 to 100 kva is designated Type FCP. Second type, FSP also features valve type lightning arrester for surge protection. Series-connected in the low voltage winding, the circuit breakers are mounted directly above core and coil and submerged in oil. As maximum safe transformer load is approached, bimetal element that is sensitive to winding temperature lights red warning lamp. If load and temperature rise continue, element trips breaker and disconnects secondary load.

Emergency overload lever can be used to restore service while transformer is hot. With lever in maximum position, warning lamp and breaker setting are ad vanced to permit nominal overload. In reset and re closing position, it disconnects lamp and closes breaker. Excessive overloads automatically recycle protective devices when lever is held in "ON" position. Primary fuses for each incoming line are located in primary bushings or on transformer board.

Federal Pacific Electric Co, Pacific Switchgear Div, 5815 Third St, San Francisco 24, Cal.

Fusible Disconnect . . .

. . . that fits any panel is available in 30- and 60-amp ratings. Used as a fused switch, the Visi-Flex De-Ion switch saves space, eliminates need for separate fuse block. Safety shield without fuse clips is available for use as disconnect.

A variety of kits can be used to modify basic switch. 30-amp model has shaft for mounting depths from 5.0625 in to 8.6562. Mounting depths for 60-amp model vary range from 5.8125 to 10.75 in.

Westinghouse Electric Corp, P.O. Box 2278, Pittsburgh 30, Pa.

Ultrasonic Cleaner . . .

. . . has self-contained filtering system, circulating pump, and recirculating tank that eliminate need for draining fluid and cleaning it externally. Known as the Glennite U-102, the unit has a one-gal. capacity and operates on a 40 to 44-kc frequency. Circulator automatically begins operating at end of predetermined cleaning period.

Gulton Industries, Inc, 212 Durham Ave, Metuchen, N. J.

Wire Rope Clips . . .

. . . for rope diameters from 0.125 to 1.5 in. are available in 16 sizes with plain, Cadmium plated, or hot dip galvanized finish. The U-bolt portion is heavy steel. Malleable saddle is shaped to fit wire rope strands to maximize grip.

Canton Mfg Co, 2406 13th St. N.E., Canton 5, Ohio

Print Viewer . . .

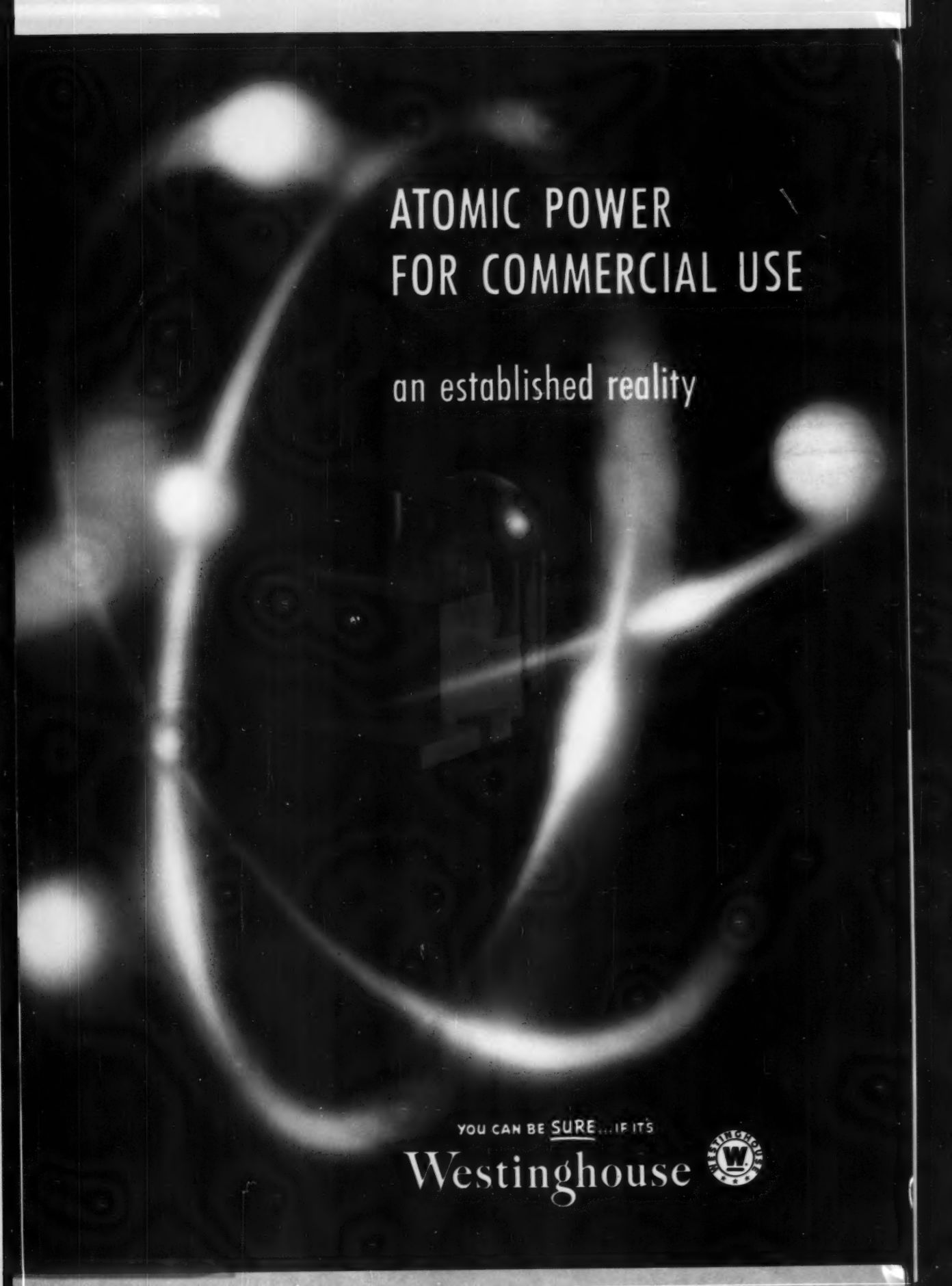
. . . handles blueprints or maps up to 40 ft long, needs 40 x 48-in. display area. Device eliminates cumbersome folding and unfolding, obliterated details in folds, and walking back and forth. Fingertip controls at base of Roll-O-Print move print back or forth. Model A is easily secured to wall or other flat surface, has plywood or masonite backing board for print marking. Model B mounts on benches, tables, or desks.

Aqua Sportsman Inc, Dept 136, 2518 Leslie Ave, Cincinnati, Ohio

Master Switch . . .

. . . for heavy duty industrial applications is small, mounts under desk. Designed for steel mills, cranes, and power shovels, it has separate operating head and switching units to simplify operation and stocking, permit more flexible mounting. Switch size ranges from 8.4375 x 5 x 3 to 16.4375 x 5 x 3. Metal cam followers lengthen life, cut maintenance. Rheostats can

(*Continued on page* 91)


ATOMIC POWER
FOR COMMERCIAL USE
an established reality
YOU CAN BE SURE... IF IT'S
Westinghouse

This is YANKEE . . .

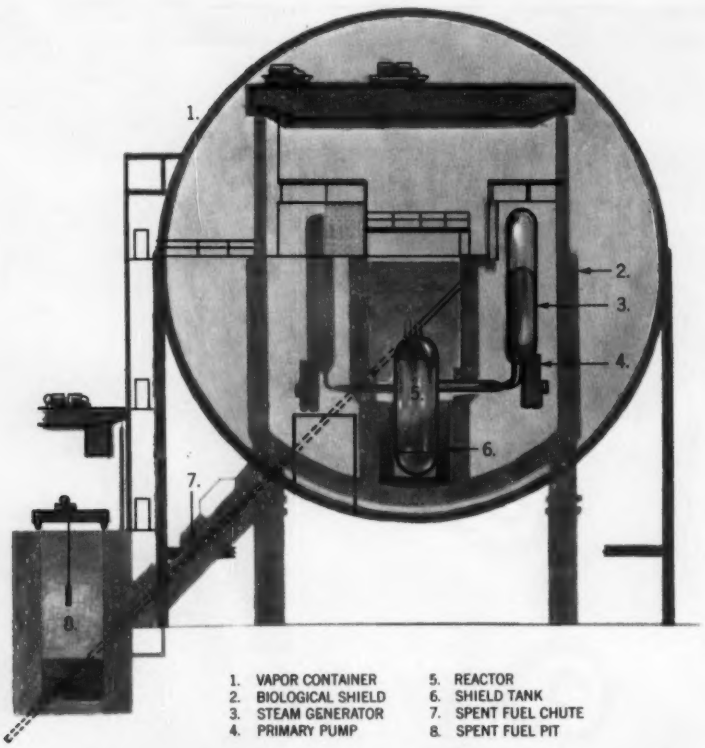
134,000 KW Power Generating Station for New England

Yankee Atomic Electric Company is building a 134,000 kilowatt atomic power plant in western Massachusetts near the town of Rowe. The overall design, engineering and construction of this plant is being handled jointly by Westinghouse Electric Corporation and Stone & Webster Engineering Corporation. Yankee's pioneering plant is being sponsored by ten of New England's leading utilities.

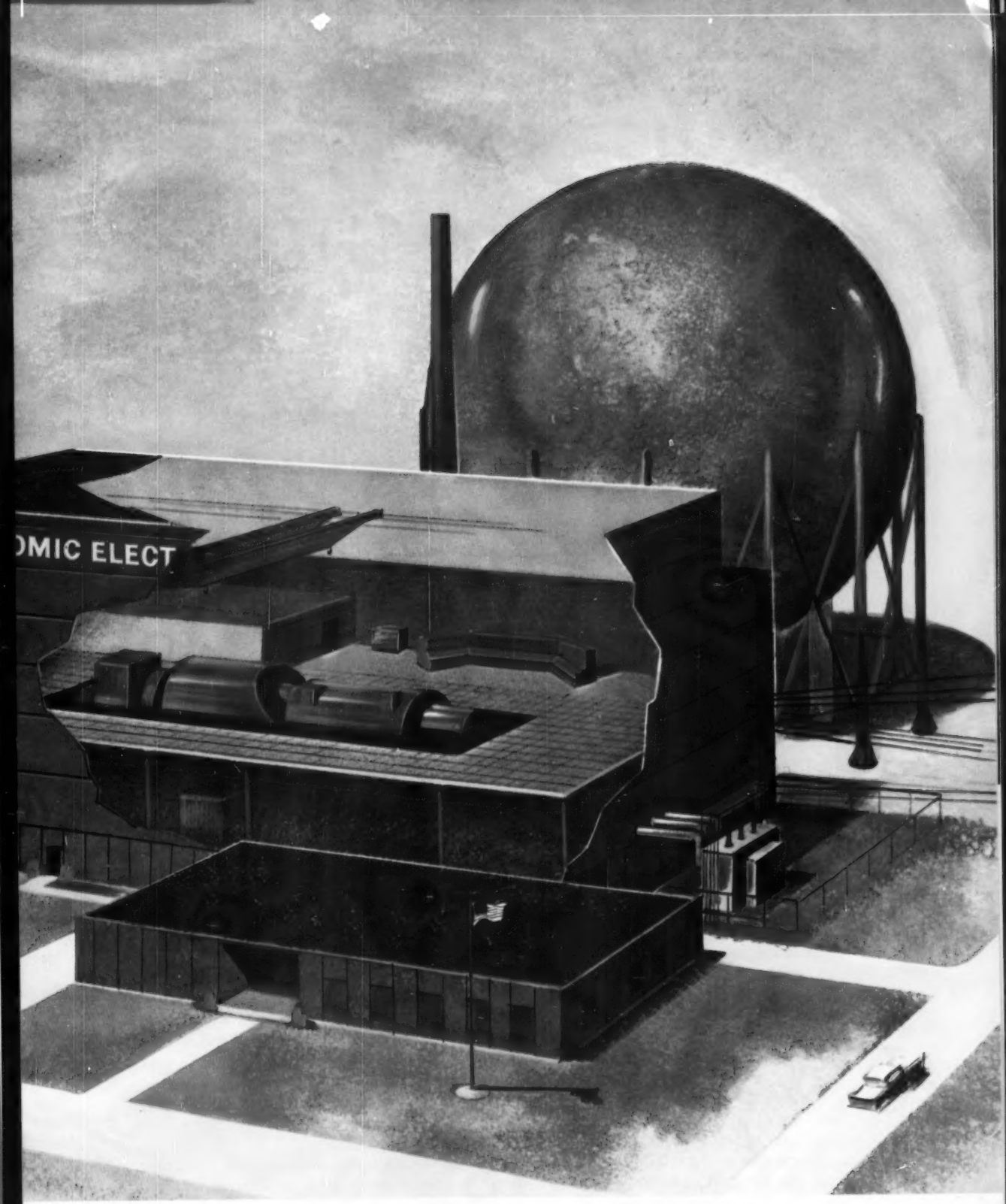
This first atomic power plant in New England will be similar to a standard steam-electric station except for the "boiler" equipment. An advanced, pressurized water, atomic reactor (using uranium as fuel) with its controls, auxiliaries and heat exchangers, will replace the conventional coal or oil-fired boiler.

The research and development program for this project is being financed jointly by the Yankee Atomic Electric Company and the Atomic Energy Commission. The AEC, through its Power Demonstration Reactor Program has agreed to underwrite up to $5,000,000 of this research and development cost. This research will benefit any company which later uses a reactor of this same general type. Yankee Atomic Electric Company has contracted with Westinghouse to carry out the research and design for its atomic reactor.

The Yankee plant is scheduled for initial operation in 1960.



1. VAPOR CONTAINER
2. BIOLOGICAL SHIELD
3. STEAM GENERATOR
4. PRIMARY PUMP
5. REACTOR
6. SHIELD TANK
7. SPENT FUEL CHUTE
8. SPENT FUEL PIT



YOU CAN BE SURE... IF IT'S Westinghouse

This group includes: APD's Technical Director; an advanced development consultant; a staff consultant on core engineering; a specialist on fuel element design and core fabrication; a technical liaison engineer.

In the atomic power market

these men are today's best buy

Westinghouse has been a leader in research and in the development of power apparatus for over 70 years. It was to maintain this leadership that the company entered the nuclear field over 18 years ago.

The Atomic Power Department (APD) is responsible for the design, development, application and sale of nuclear steam generators for the generation of electric power and industrial steam and for merchant marine propulsion. APD is also charged with the coordination of applications which involve the complete apparatus which Westinghouse manufactures for atomic power plants.

Among the additional projects at Westinghouse Atomic Power Department are: the first large aqueous homogeneous reactor (in partnership with Pennsylvania Power and Light Company); the Belgian Thermal Reactor, the first atomic power generating plant sold in the international market.

Westinghouse is ready — from planning to engineering to production of everything from reactor core to customer's meter. For complete information or assistance, contact your Westinghouse Sales Engineer, or write: Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. AP-4500

YOU CAN BE SURE...IF IT'S Westinghouse

Master Switch

(*Continued from page* 86)

be added to provide stepless switching. Operating heads with seven points in each direction are available with 4, 6, 8, and 12-circuit switch units. Switch is rated 15 amp at 600 v ac, has d-c inductive rating of one amp at 250 v dc. Redesigned heavy duty and general duty switches for surface mounting have the same ratings.
General Electric Co, Schenectady 5, N. Y.

Inserting Machine . . .

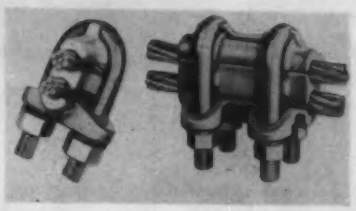
. . . processes up to 6,000 bills or checks per hour with one operator. The two-station machine gathers enclosures, opens flaps, stuffs, seals, prints indicia, counts and stacks. Return envelope or other second enclosure can be handled as well as multi-sheet items. It is geared to speed of billing, tabulating and data processing equipment.
Inserting & Mailing Machine Co, Phillipsburg, Pa.

Guy Wire Securing Rigs . . .

. . . handle line tensions up to 3,500 lb. Designed to take galvanized and stainless steel cable in erecting temporary towers, they feature quick take-up, easy release, positive lock, and 90% of original cable strength. Model SP-4035 is for use with $\frac{3}{16}$-in. cable, has compression spring that sets at 100-lb pull. Model SP-3110, for ⅛-in. cable, has spring that bottoms at 60-lb pressure. All parts of rig have protective finish.
Eastern Rotorcraft Corp, 400 Swamp Rd, Doylestown, Pa.

Ultrasonic Tanks . . .

. . . for cleaning, degreasing, pickling, or electroplating, have high efficiency. The T-5 5-gal tank uses a 400-w generator, the T-8 8-gal tank, a 700-w unit, both operating at 20 kc. Attaching transducer by riveting increases conversion efficiency of ultrasonic energy, makes unit rugged. Stainless steel treatment chambers have input and output drains to permit recirculation and filtering of liquid medium.
General Ultrasonics Co, Hartford, Conn.



U-Bolt Connectors . . .

. . . for general transmission and heavy distribution connections, taps, and loops are offered in two types: one-bolt model uses either steel or aluminum hardware; two-bolt uses aluminum only. Designed for making aluminum-to-aluminum connections, they are cast of high-strength aluminum alloy. Bright-dipping and compound coating assure clean, protected connections. Conductor grooves are contoured to trap all outside conductor strands, prevent "bird caging" under surge conditions. Contact surfaces provides a tight, low-resistance connection.
A. B. Chance Co, Centralia, Mo.

More New Products

Electro-mechanical **motor overload control,** the Load Sentry, has adjustable overload setting. Interlock keeps circuit broken until overload is removed. Load relay is energized when control is operating. —Assembly Products, Inc. Chesterland, Ohio.

Shock absorber for motor brushes in heavy duty equipment consists of hard rubber cap laminated to Neoprene pad. Design absorbs vibration, reduces spring finger wear—Speer Carbon Co, St Mary's, Pa.

Remote control unit to adapt pushbutton-started gasoline engine plants for standby use provides cranking disconnect when engine fires and overcranking disconnect and lockout if engine fails to fire.—Automatic Switch Co, Florham Park, N. J.

Advan-Guard **ballast protective device** keeps fluorescent lamp ballasts from operating at abnormal temperatures, lengthens ballast life—Advance Transformer Co, 2950 N. Western Ave, Chicago 18, Ill.

Bulletin 800 **pushbuttons** and **selector switches** include ratings of: 110 v ac, 3 amp; 220 v ac, 2 amp; 440/550 v ac, 1 amp; 115 v dc, 1 amp; 230 v dc, 0.5 amp; 550 v dc, 0.2 amp. Allen Bradley Co, 136 W Greenfield Ave, Milwaukee 4, Wis.

Transformer tank grounding connector is cast of high conductivity bronze, handle No. 8 solid to No. 2/0 stranded. Eye bolt rotates to horizontal or vertical position.—J. A. Weaver Co, 2110 Howard St, St Louis, Mo.

Flex-Seal Type XL **flexible electric conduit** is liquid-tight, withstands salt air, corrosive fumes, and chemicals. It comes in 0.375, 0.5, 0.75, and 1.0-inch sizes. Columbia Cable & Electric Corp, Brooklyn, N. Y.

Grid-X **tracing paper and cloth** with non-reproducible cross section lines is available in transparentized 100% rag and in water repellent cloth.—Charles Bruning Co, 4700 W. Montrose Ave, Chicago 41, Ill.

Video monitors for continuous duty in closed circuit TV systems have bright, clear, high definition pictures. 14 to 27-in. models are available.—General Precision Laboratory, Pleasantville, N. Y.

Thymotrol **adjustable speed drives,** rated 50 to 300 hp, feature regenerative breaking and reversing.

Manual **motor starters** with plug-in heaters are designed for use with single-phase motors up to one hp in grinders, blowers and conveyors.

Push-to-test **indicating light unit** provides quick, easy method of detecting burned-out bulbs in control panels and pushbutton stations.

Shaft-mounted **speed reducers** in ratings from ¼ to 40 hp has output speeds from 10 to 420 rpm. Single and double reduction ratings include ratios of 5:1 and 15.1.—General Electric Co, Schenectady 5, N. Y.

SIMPLIFIES INSTALLATION: Anaconda Silvaline Type SE Cable—in ratings up to 200-Amps—

SILVALINE TYPE SE CABLES—100-AMP RATINGS OR MORE

(Copper Conductors)

CONDUCTOR	INSULATION	RATING (in amps)
3/C #3 with #3 or #5 neutral	RHW 75C	100
3/C #2 with #2 or #4 neutral	RHW 75C	115
3/C #1 with #1 or #3 neutral	RHW 75C	130
3/C #0 with #0 or #2 neutral	RHW 75C	150
3/C #3/0 with #3/0 or #1/0 neutral	RHW 75C	200

(Aluminum Conductors)

CONDUCTOR	INSULATION	RATING (in amps)
3/C #2 with #2 or #4 neutral	RHW 75C	100
3/C #1 with #1 or #3 neutral	RHW 75C	110
3/C #1/0 with #1/0 or #2 neutral	RHW 75C	125
3/C #2/0 with #2/0 or #1 neutral	RHW 75C	150
3/C #3/0 with #3/0 or #1/0 neutral	RHW 75C	170
3/C #4/0 with #4/0 or #2/0 neutral	RHW 75C	200

Even with 200-

you can install

Anaconda Silvaline* Type SE Cable is available in both copper and aluminum in sizes up to #4/0—large enough to handle even 200-Amp service. No conduit needed with Silvaline; save time and money in installation.

can be installed *without conduit* from weatherhead to meter to fuse box, and then to range.

Amp service—
Silvaline Cable without conduit

Even with higher ratings no conduit is required with Silvaline Service Cable. And it's fully approved.

Now, with more and more builders specifying 100-, 200-Amp service—to meet the need for more power to run today's and tomorrow's hot-water heaters, heat pumps and other heavy-current appliances—the time and labor you save installing Silvaline in place of both cable and conduit may be the margin of a successful bid. Silvaline also offers . . .

Longer life under severe conditions. Silvaline is the only service entrance cable with URC† saturant and finish. Resists festooning . . . assures long life.

No complaints. Silver finish on Silvaline takes any type or color of house paint . . . won't bleed through, flake or peel. Ends customer complaints.

Silvaline can be installed from pole to meter to panel box—and then to range.

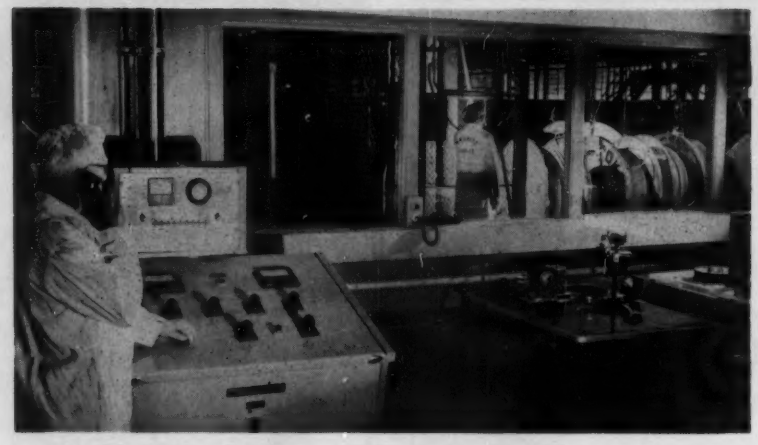
See the Man from Anaconda or your Anaconda distributor for full information. Also—send for folder on Silvaline Type SE Service Cable. Anaconda Wire & Cable Company, 25 Broadway, New York 4. N. Y. 67809

*Reg. U. S. Pat. Off. †Utilities Research Commission

LIVE BETTER ELECTRICALLY

ASK THE MAN FROM **ANACONDA®**

FOR SILVALINE TYPE SE
SERVICE ENTRANCE CABLE



Okonite Centralizes Testing

Electrical testing department at Okonite Co's new North Brunswick, N. J., plant is centrally located so that it can handle material passing through the factory and also finished products.

As the test office and control consoles are adjacent to the testing area, a test engineer, standing at either of the consoles (see picture) has full view of the test area. Four fence-enclosed elevator test tanks 16 ft deep, each with a capacity of 2,700 cu ft of water, are located in the test area. They handle 40,000-lb loads and can submerge 9-ft diam. reels. Tests, which can be made up to 78,000 v on present equipment, take place after a submersion of at least eight hours.

Special features of the testing area involve four-way safety controls. These comprise audible signals (horns), lights (flash signals), electrically interlocked gates, as well as telephone communication between all areas and the control room. Pens and tanks in use are recorded on an illuminated annunciator board in the control room.

GE Develops Double-Oriented Iron

"Four-square" silicon iron, a double oriented magnetic sheet material which is easily magnetized in four directions, has been developed by General Electric Research Laboratory. It will be used to increase the efficiency of transformers, motors, and generators.

"Orientation" in silicon iron is achieved by aligning the individual crystalline grains in the finished sheet material. The doubly-oriented "four-square" effect is produced by a different kind of alignment, technically referred to as "cube texture", which gives magnetic properties not only back and forth along the sheet but also both ways across the sheet.

Basic raw material is a form of silicon iron similar in composition and cost to the typical kinds of soft magnetic sheet used in modern transformers and motors. Processing steps for "four-square" iron follow the same general pattern as singly-oriented materials.

Singly-oriented iron has reduced transformer core losses to a tenth of the original unalloyed iron with the doubly-oriented product promising an even further reduction. Lower energy loses and reduced noise can be expected in electrical equipment when the product gets into production, reports Dr. Guy Suits, vice president and director of research. The magnetic sheet is presently in pilot-plant production.

DP&L Paints Trucks, Meters with DeVilbiss Units

Among the facilities included in the new garage and neighboring service building of Dayton Power & Light Co are several spray painting units. These units are products of DeVilbiss Co, Toledo, Ohio.

In the garage two truck painting booths make it possible for the utility to care for its 650-vehicle fleet internally. Three to four complete refinishing jobs are done each week, accounting for about 85% of the work done in one booth. The other 15% is in touch-up. A glaze to keep the trucks and cars bright and shiny is applied in another booth, turning out two vehicles a day.

The service building has four booths using the same type of DeVilbiss equipment. In two booths, transformers and meters that came in for repair are sprayed with an oil, slow-drying paint. In a third booth electric meters are sprayed with quick-drying enamel. The fourth is used for spraying quick-drying aluminum paint to gas meters. Idle time in the first two booths is used for painting office equipment and other maintenance jobs.

R-C Fly Ash Collectors Ordered for Dunkirk 3 & 4

A precipitator installation for Niagara Mohawk Power Corp's Dunkirk Steam Station Units 3 and 4 was ordered recently from Research-Cottrell, Inc, Bound Brook, N. J.

For removal of fly ash, the precipitators will be designed to clean a total of 1,286,000 cfm of flue gas at 275F with a design efficiency of 96.5% from two pulverized coal-fired boilers rated at 1,470,000 lb of steam per hr, 2,400 psig, and 1,050/1,000F. These boilers will be installed for an addition of 400 Mw to the station.

The four combination Cyclo-Trell and electrostatic precipitators will incorporate two modern de-

(*More M&M on page* 96)

New..Delta-Star Heavy Duty Aluminum Connectors!

Delta-Star announces a complete new line of connectors. Extra rugged construction and engineered for maximum service life under all conditions... Particularly important in this new line are the heavy walls and generous overall dimensions. With these features pressure is distributed to permit optimum contact yet with negligible cold flow...All sizes and ranges of conductors are cast on surface of each connector...Can be supplied in types and sizes to meet all connector requirements. For further information, write Delta-Star Electric Division, H. K. Porter Company, Inc.—2437 West Fulton Street, Chicago 12, Illinois.

District Offices in Principal Cities

DELTA-STAR ELECTRIC DIVISION
H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc.: Connors Steel, Henry Disston, Quaker Rubber, Leschen Wire Rope, Refractories, W-S Fittings, Delta-Star Electric, Riverside-Alloy Metal, Vulcan Crucible Steel and H. K. Porter Company (Canada) Ltd.

75 YEARS OF SERVICE

CON EDISON this year celebrates the Diamond Jubilee of the opening of its Pearl Street Station. In lower Manhattan, a bronze plaque now marks the site where it all began...75 years ago. For as many years, Kennecott Wire and Cable and its predecessor company has continuously served all branches of the electrical industry and has been privileged to serve Con Edison for many years. We are proud of this association, and offer our congratulations to one of America's great pioneer companies.

CHASE BRASS & COPPER CO.
WATERBURY, CONNECTICUT

National Distributor for

KENNECOTT WIRE & CABLE CO.

Subsidiary KENNECOTT COPPER CORP.
PHILLIPSDALE, RHODE ISLAND

CHASE WAREHOUSES and OFFICES:

Atlanta	Cleveland	Indianapolis	New Orleans	Rochester
Baltimore	Dallas	Kansas City, Mo.	New York	St. Louis
Boston	Denver	Los Angeles	(Maspeth, L.I.)	San Francisco
Charlotte	Detroit	Milwaukee	Philadelphia	Seattle
Chicago	Grand Rapids	Minneapolis	Pittsburgh	Waterbury
Cincinnati	Houston	Newark	Providence	

velopments for the power supplies of the electrostatic components, the Cottrell automation system and silicon rectifiers.

Eliminating conventional manual controls, the system is reported to provide peak "round the clock" gas cleaning efficiency. Electronic feedback circuits, one for each electrical set, will continuously monitor precipitator operation to maintain sparking rate, current, and voltage at the levels necessary for optimum fly ash collection efficiency.

Alarm System Detects Incipient Icing Conditions

Detection of formation of ice on various outdoor installations is provided by a method made available by American Instrument Co, 8030 Georgia Ave, Silver Spring, Md. This system is said to anticipate icing because it is actuated by two sensing elements which respond to ice-forming conditions, that is, low temperatures and precipitation.

Each system consists of two parts: (1) the detection unit which is installed on the antenna or other outdoor location, and (2) the control box and associated alarm devices which are installed indoors. Transmission distance is determined by type of cable used. Distances of 2,000 ft are attainable with RG-62/u cable.

Approximately 100 systems have been reported furnished for protecting radar towers on the DEW line and project Alice.

Project Bids Invited and Accepted in Argentina

Bids to build a dam and supply equipment for a hydro-electric power plant at Punta Negra on the San Juan River in San Juan Province have been called by the Argentine State Water and Power Board, Buenos Aires.

The project includes construction of a diversions dam 40-ft high with a tunnel 22-ft diam. to carry water to an aqueduct canal. Ullun hydro-electric station will have an installed potential of 20 Mw. It is expected to produce 110 million kwhr annually.

Bids will open on Oct. 28 of this year. 140 million pesos is the official budget for the project. At the official 18-1 exchange rate this is $7.8 million.

Low bid for the 600-Mw power station has been accepted from Metropolitan-Vickers Electrical Export Co, Ltd, London. The offer was for 700 million pesos plus 27.5 million pound sterling which at the free market exchange rate totals $91.75 million.

Other bids were submitted by International General Electric Co, Westinghouse Electric International Co with Societa Edison of Milan, British Thompson Houston Export Co of London, and a consortium composed of Kuljian Corp of Philadelphia, six Italian companies, and seven French compaines.

Westinghouse Reports on Some Equipment Orders

Westinghouse Electric Corp has announced the following orders for generators, motors, rectifiers and elevators, and development of an underground enclosure for distribution transformers.

• Order for a 352-Mva turbine-generator has been placed by Houston Lighting & Power Co. This unit is scheduled for operation at Smithers Lake outdoor station in 1961. It is a tandem-compound, triple-flow, 3,600-rpm unit 108 ft long, weighing more than 800 tons including a 50 ton rotor.

• More than 21,500 hp is being manufactured by the Sunnyvale, Calif., division in motors for the Toquepala project of the Southern Peru Copper Corp. Largest units will be 21 identical 800-hp motors for rod mills and ball mills, with 14 other motors over 300 hp also being built.

• Three identical 19,200-kw hydroelectric generators are also being constructed at Sunnyvale. Rated 13,800 v at 138½ rpm, the 25-ft high units have been ordered by Portland General Electric Co—two for North Fork dam and the third for Faraday dam. Shipment is

(*Continued on page* 98)

New ladder mount positions easily even on high-crowned or inclined roads

At last the horizontal positioning of ladder mounts on high-crowned or inclined roads can be done easily. Now one man can spot the new Keystone HDG ladder mount with virtually no effort. No lugging . . . no tugging—even against the heaviest gravity loads resulting from tilted parking.

WHAT'S THE SECRET? The new Keystone HDG ladder mount is driven by a specially-designed two-speed self-locking gear assembly. It provides low speed with high torque or high speed with low torque. To spot the ladder precisely or return it to the ladder rest is an effortless job.

RUGGED, FLEXIBLE, COMPACT. The new Keystone HDG ladder mount is ruggedly constructed to prevent deflection, side sway, and twisting. Assures longer life with minimum maintenance. Can be rotated horizontally through 360 degrees and locks automatically in position at any point. Requires only 42″ diameter for mounting in a truck.

Specify Keystone HDG ladder mounts by name on your next truck order. For further information write Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc., 17th and Cambria Sts., Philadelphia 32, Pa.

The speed-selector gear box that enables one man alone to "spot" the new Keystone HDG ladder mount on high-crowned, inclined, or level road.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

ELECTRIC SERVICE WORKS

Divisions of H. K. Porter Company, Inc.: Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, H. K. Porter Company (Canada) Ltd.

It's NEW!

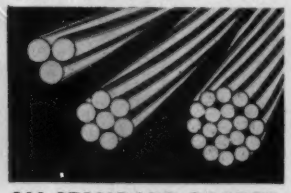
Wire that combines the strength of steel with the high corrosion resistance of aluminum

It's ACCO *Aluminized!*

PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*

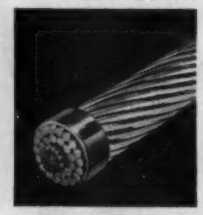


ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Also... PAGE *Aluminized* ACSR CORE WIRE



Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for Booklet DH537-A.

ACCO for Better Values

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO

scheduled for February, April, and June, 1958.

• Development and availability of Micarta, glass reinforced polyester, housing for enclosing distribution transformers in underground installations, has been announced by the company. These housings weigh less than 300 lb and can accommodate single-phase distribution transformers up to 167 kva including disconnects.

• Aluminum Co of America has contracted for approximately $4 million of electrical equipment for part of the power conversion of its Massena, N. Y., plant. Westinghouse transformers, circuit breakers, and rectifiers will be used to convert high-voltage ac to dc for aluminum production.

• A 38-story "pilot-less" elevator system of 20 passenger elevators will be built for the Tishman skyscraper, N. Y. City by the elevator division.

PLANT EXPANSIONS

New plants and plant expansions have been reported as follows:

• Transmission towers and switchyard structures will be fabricated and galvanized in a new plant at Fort Madison, Iowa, by Anchor Metals, Inc, of Hurst, Texas, reports Clyde Mooney, president. The 55,000-sq ft plant is expected to be in operation by Nov. 1. Wallace J. Anderson is executive manager and Darrell McLemore is production manager. Boyles Galvanizing Co of Hurst will furnish hot dip galvanizing services at the plant.

• Occupancy of a new office and warehouse building by American Chain & Cable Co, Inc, followed the outgrowing of the firm's former building. The new structure containing 26,000 sq ft is part of a development in the Central Mfg District of Los Angeles.

• To increase ingot capacity by nearly 25% and rolling capacity by 40% Lukens Steel Co, Coatesville, Pa., is beginning construction of a $33 million project which includes a new electric furnace with supporting facilities.

ELECTRICAL BUSINESS OUTLOOK

Electrical World
AUGUST 26, 1957

Mass housing contracts for '57 will be down 20% from last year, predicts McGraw-Hill's "Construction Methods and Equipment" magazine. Value forecast for 1957 will be $6.2 billion, down from last year's $7.7 billion. And builders sadly agree that their goal of one million starts is now out of reach.

July housing starts were not encouraging. They inched "up" to a six-year low. Although the annual rate of 980,000 was slightly better than June, actual starts slipped from 97,000 to 96,000. This made it the worst July since 1951, when only 90,500 units were begun. By way of contrast, last July saw 101,100 starts.

And the entire slump is in government-backed private housing.

The government's cut in FHA down payments is expected to boost homebuilding, although probably not much until next year. A $15,000 house now takes only $1,050 down, compared with $1,950 a month ago.

• • •

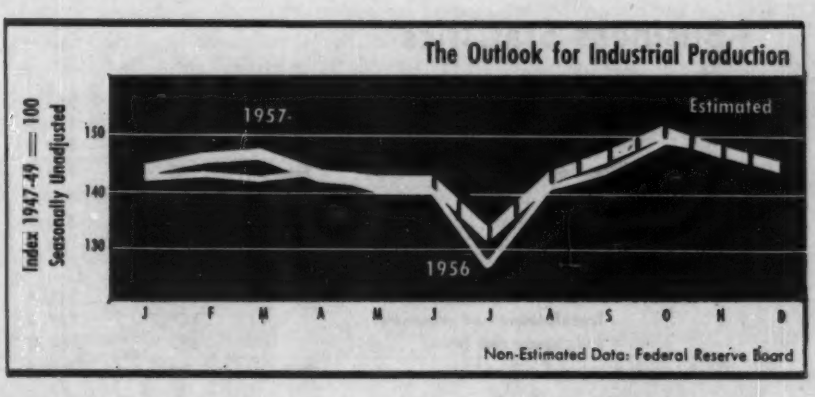
Appliance manufacturers are hoping for relief before next year. One company extended its vacations for a third week in order to balance inventories. Says another big manufacturer: "We might as well face it; volume this year will fall 6% to 10% behind 1956."

But an upturn in appliance buying is in the cards. How steeply the curve will rise is guesswork right now, but one appliance firm is taking on extra help, and several have expressed their confidence by stepping up steel purchases.

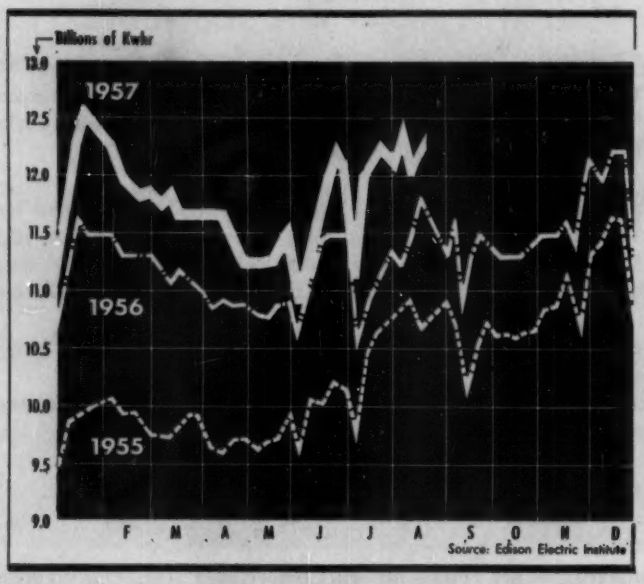
• • •

For the overall picture of business activity, there's the Commerce Dept's latest revision on gross national product (that's the sum of all goods and services produced). GNP hit $434.4 billion in the second quarter—up $5 billion from the previous quarter. But as the experts point out, most of the gains were due to higher prices.

This ties in with the latest reading on the Federal Reserve Board's index of industrial production. July's figure was down 10 points to 135 (see chart). But seasonally adjusted, the index has hardly budged in four months.



STATISTICS



OUTPUT

Week ended August 17,
12,409,000,000 Kwhr
Up 5.2%

Per Cent Change From Previous Year

	Aug. 3	Aug. 10	Aug. 17
Total U. S.	+11.5	+ 4.7	+ 5.2
New Eng.	+ 9.0	+ 4.2	+ 1.2
Mid. Atlan.	+11.3	+ 3.0	− 0.9
Cent. Ind.	+13.7	+ 3.2	+ 3.9
West Cent.	+19.0	+ 5.0	+10.3
Southeast	+ 6.7	+ 3.9	+ 6.3
South Cent.	+16.6	+ 5.6	+ 7.2
Rocky Mount.	+ 8.1	+ 8.0	+ 6.3
Pacific			
NW	+ 6.5	+10.5	+ 8.9
SW	+12.6	+ 7.3	+10.5

Seasonally Adjusted Index 234.5
Week Ago 225.9
Year Ago 222.5

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 6.5%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	May	122.79	122.27	117.43	4.6
Peak—Class 1 Systems. million kw	May	97.8	97.7	92.8	5.4
Estimated Dec. '57 Peak	May	113.6	113.8	114.3	−0.6
Production—billion kwhr	May	51.70	50.67	49.09	5.3
Hydro		11.80	12.05	11.71	0.8
Fuel		39.90	38.62	37.38	6.7
Sales—billion kwhr	May	46.60	47.15	44.18	5.5
Residential		11.86	12.72	11.07	7.1
Commercial		7.38	7.25	6.75	9.3
Industrial		24.89	24.66	24.03	3.6
Other		2.48	2.52	2.33	6.4
Fuel Consumption	May				
Coal—million tons		12.60	12.50	12.05	4.6
Oil—million barrels		6.31	6.47	4.47	41.2
Gas—billion cu ft		108.66	98.80	110.51	−1.7
Net Income Class A & B Co's—$ million	June	109.69	101.75	101.54	8.0
Residential Customers—millions	12 mos.	46.16	46.06	44.86	2.9
Revenue per kwhr	ended	2.58¢	2.58¢	2.62¢	−1.5
Avg kwhr per customer	May 31	3,047	3,034	2,858	6.6
Avg annual bill		$78.61	$78.28	$74.88	5.0

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	July	135	145	128	5.5
ENR Construction Cost	Aug.	154.8	151.8	146.0	6.0
BLS Cost-of-living	June	120.2	119.6	116.2	3.4
New Orders for Machinery (1950 = 100)	June	155	149	154	0.6
NEMA Sales					
Insulation materials	June	140	148	156	−10.3
Electric appliances		93	88	106	−12.3
Wholesale prices	May				
Motors and generators		141.3	141.4	132.1	7.0
Transformers and regulators		147.7	147.4	137.5	7.4
Switchgear and fuses		165.9	164.4	151.2	9.7
GNP—annual rate—$ billion	2nd Qtr.	434.4	429.1	410.8	5.7

MANAGEMENT BULLETIN

FINANCE

Tight money policy is entering a spectacular phase and headed toward a climax, advises Goodbody & Co. Government sold two-year bonds at 4% a month ago. Today short term bills are bringing over 4%. If present money conditions prevail when the Treasury is forced to raise $3 billion in October or later in the fall, Goodbody & Co says, the long term cost would be near 5%. This would be a record since the establishment of the Federal Reserve Board.

Fed is on the spot, says Goodbody & Co, having only recently defended its policy. The only way it can get off the spot is through some natural softening of money or through some excuse to change its policy. A crack in the stock market might give such an excuse, Goodbody & Co reports, "so we have to assume that the board would like to see such a crack and that it will try not to change its policy until it gets it. A natural softening of money would come about through a decline in business and this could result in a crack in the market."

Silver lining to climbing interest cloud (new 5% peak yield was set by offering August 14 of double "A" rated Northern States Power Co bonds which were sold quickly) may be the justification for increase in electric rates to compensate for higher money costs, particularly where present rate of return is subnormal.

Net income of 68 electric and gas utilities shows a 5% gain for the first six months of 1957 over the like period of 1956. So reports the First National City Bank in its August monthly letter that lists the earnings of some 750 leading corporations. For the June quarter of 1957 the net income was up 6% over the same quarter of 1956.

Corporate pension funds are important investors. Assets at the end of 1956 for these funds, reports the Securities and Exchange Commission, totaled $16.6 billion (market value of $17.6 billion) as compared with $6.9 billion in 1951.

These funds had 78% invested in corporate bonds and stocks in 1956 as against 75% a year earlier. Over 52% of the assets were invested in corporate bonds, over 26% in common and preferred stock, 14% in U. S. Government securities, and 8% in other assets.

The pension funds purchased $1 billion of common stock during 1956. They sold $229 million, leaving net purchases of $771 million.

Employees of the Long Island Lighting Co will soon get a chance to buy some of the company's common stock. LILCO has petitioned the New York Public Service Commission for permission to sell 200,000 common shares to its employees.

Grand River Dam Authority, Venita, Okla., can now sell bonds. It has signed a power exchange contract with the Public Service Co of Oklahoma. W. R. Holway, consulting engineer for the authority, said the signing of the contract should make it possible to obtain State Supreme Court validation and the consent of present GRDA bondholders to sell revenue bonds for the Markham Ferry Dam on the Grand River in eight to 12 months. Previously the Oklahoma Legislature had approved a measure increasing the bonding capacity from $50 million to $130 million.

EMPLOYEE RELATIONS

Is yours a growing company? Must you develop more and better managers in short time? If so, you may want to consider sending some of your employees to the "4 Management Institutes" conference. It covers:

- Modern management principles and techniques . . . with emphasis on the planning function.
- How to tap hidden potentials for productivity . . . by helping subordinates develop.

- Sound executive decisions . . . how to make them.
- Successful managing . . . a management orientation institute.

For further information, write Arthur J. Slade, Rogers, Slade & Hill, 551 Fifth Ave, New York City 17.

Have you a booklet for your new employee explaining the job and working conditions of your company. If not, you may want to take a look at one just released by the Iowa Electric Light & Power Co entitled "Your Job . . . and Your Future." It was prepared to help the employee know two things: first, something about the company, its business, responsibilities, and general organization; and second, employee benefits and responsibilities as a member of the company. You can obtain a copy by writing Harold J. Rowe, ad director, Iowa EL&P, Cedar Rapids, Iowa.

Carolina Power & Light Co makes changes in its employee magazine, "Spotlight". It is now beginning its 21st year of publication with a "new design and a new purpose." As Spotlight must act as "an employee of the company", the editor said that the job of the new "Employee-in-print" should be:

- To develop employee appreciation of company's efforts and achievements;
- To develop the realization that corporate success is based on the wisdom and success of individuals in the daily performance of their jobs;
- To develop employee understanding of company economics; and
- To develop employee initiative in behalf of the company and the industry.

If you are interested in professional engineering salaries, you may want to take a look at the "Income and Salary Survey" for 1956 just released by the National Society of Professional Engineers. This is the third in a series which began in 1952. Copy may be obtained for $1 by writing the society at 2029 K Street, NW, Washington 6, D. C.

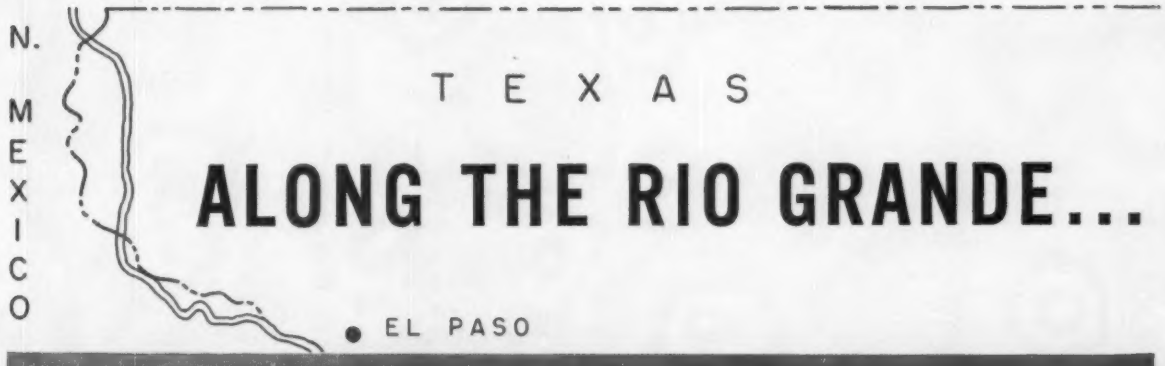
RATES

"Business is fine," was the comment by Manager L. L. Luna, Ozark Border Electric Cooperative, Popular Bluff, Mo., when rates were reduced by about 4%. He stated that he had sought permission from the Rural Electrification Administration to reduce rates even further but had been refused. The REA loan, he said, will be all paid by December—two years ahead of schedule.

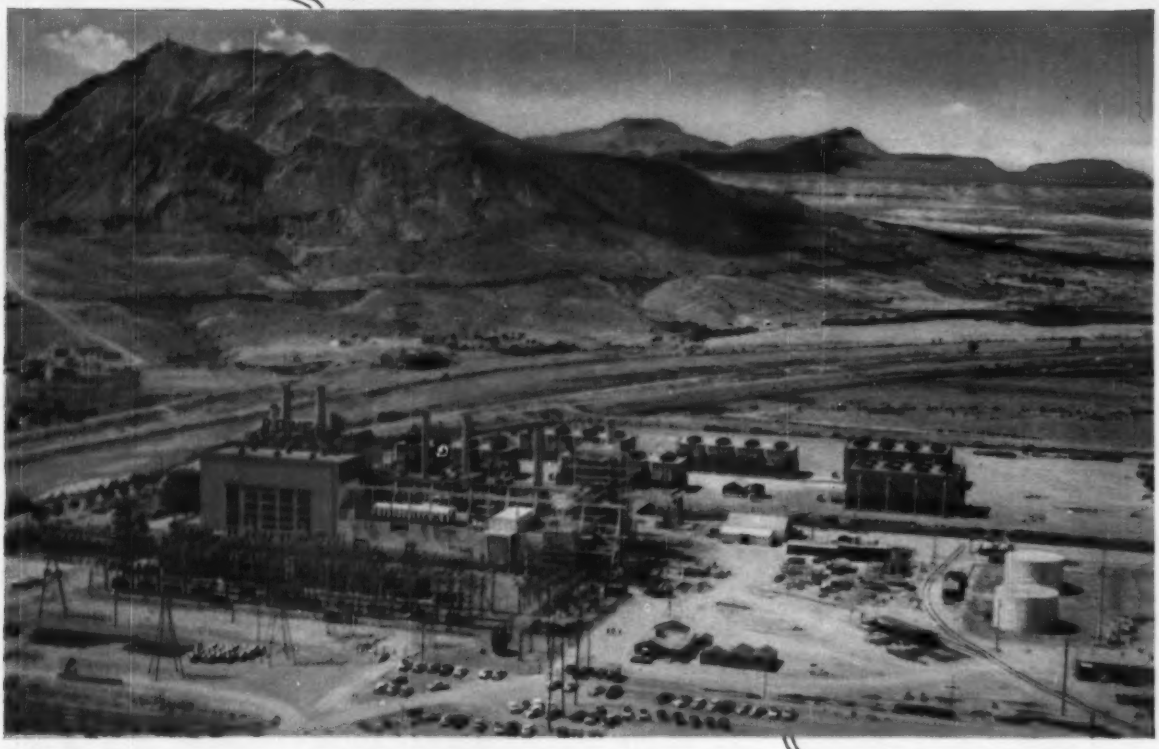
PUBLIC RELATIONS

Kilowatito, a Mexican cousin of Reddy Kilowatt, is being introduced by the Mexican Light & Power Co and Compania Impulsoria de Empresas Electricas. While the program still is too new to have had much reaction, there have been a couple of instances which indicate that Kilowatito is creeping into the public mind. The mayor of Puebla asked the Impulsoria company if it couldn't change the drawing of Kilowatito which was being displayed on a large sign. It seems that this Kilowatito, drawn by a Puebla artist, was not the same Kilowatito that the mayor had come to know through other media. Another instance, a customer walked into a company office to make a complaint. Officials were pleased to note that the man was lodging his complaint against Kilowatito and not against the company. It was noted also that the man spoke a little English. As he was turning away, he jokingly referred to Kilowatito as a "son of a switch."

Educational literature on the electric industry is now available. Electric companies can now obtain a complete packet of field-tested teaching aids covering the lower and upper elementary grades and junior and senior high school. It is entitled "Power in Our Lives." It was instigated by companies in the Public Information Program's West North Central region. For prices and other info, contact Paul S. Amidon & Associates, 429-432 Plymouth Building, Minneapolis 3, Minn.



ALONG THE RIO GRANDE...



The Southwest has become one of the centers of national defense. Here, served by the Rio Grande Station of the El Paso Electric Company, are Fort Bliss, Beaumont General Army Hospital, Biggs Field, White Sands Proving Grounds, Holloman Air Development Center and many strategic industrial firms.

Stone & Webster Engineering Corporation designed and built the original Rio Grande Station which produced 49,000 kilowatts, as well as subsequent additions that raised its capability to 200,000 kilowatts. Currently Stone & Webster is installing another unit with a capability of 50,000 kilowatts which is scheduled to go on the line next year.

Write or call us for information as to how our experience may be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY of STONE & WEBSTER, INC.

New York • Boston • Chicago • Pittsburgh • Houston • San Francisco • Los Angeles • Seattle • Toronto

This shopping center consumes enough electricity to supply 25,000 homes

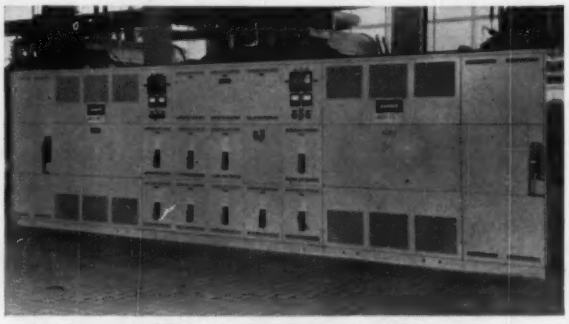
Here are 161 acres of shopping convenience—the Northland Center development of the J. L. Hudson Company in suburban Detroit. The branch department store and some 80 other Northland Center stores use electric power for interior and exterior lighting, elevators, conveyors, escalators, pumps and blowers, and compressors for air conditioning and refrigeration.

So great is this shopping center's demand for electricity that the Detroit Edison Company has built a substation there large enough to supply the electrical needs of 25,000 homes.

Eleven double-ended substations, rated 1500 and 2000 kva, are required to distribute this electric power. Each unit substation is equipped with two Wagner dry-type transformers which meet all requirements for safe indoor installation because they are fireproof and explosion-proof.

Wagner Transformers play an important role in supplying power to many major businesses and industries so they can work better electrically.

Why not discuss *your* next indoor or outdoor transformer installation with a Wagner engineer? Call the nearest of our 32 branch offices, or write us.



This Wagner-equipped Unit Substation is installed in Northland Center utility house for 4800-480 volt power distribution.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

WT57-7

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Merrimack-Essex Elects Seven to Top Posts

Newell Clark is chosen to head newly organized operating subsidiary of New England Electric System

Merrimack-Essex Electric Co, newly formed operating utility composed of five New England Electric System subsidiaries, is headed by Newell A. Clark as president, with Edward F. Ziegler as vice president and general manager.

Elected as vice presidents of the organization were William E. Casey, Thomas J. Hickey, H. Sherman Holcomb, Albert Leddy, and Ray Pike, Jr.

Merrimack-Essex, third largest NEES subsidiary, was formed through the merger of Amesbury Electric, Essex County Electric, Haverhill Electric, Lawrence Electric, and Lowell Electric companies.

Clark, new president, has served as principal officer of all NEES companies in northeastern Massachusetts since 1949. His career with the system began as station foreman for Fall Mountain Electric Co, Vt., in 1921. Five years later he became general manager and in 1929 was named assistant general manager of Narragansett Electric Co. He advanced to manager of Quincy Electric Co in 1930. After four years in that position he was appointed district manager at Leominster, Mass., and from 1944 to 1949 he was Northampton district manager.

Ziegler, vice president in charge of labor relations for system companies since early in 1952, joined NEES in 1929. From his first position as district engineer in Lawrence, Mass., he rose in 1934 to assistant to the district manager at Lowell, Mass. In 1943 he was appointed vice president at Lowell, becoming assistant district manager in 1948 and in 1951 assistant vice president of New England Power Service Co.

Casey, who will have offices at Lawrence, is former vice president and manager of Lawrence Gas & Electric Co. He has also been assistant manager of Worcester County Electric Co.

Hickey, who most recently was vice president of Lowell Electric Light Corp, will represent Merrimack-Essex at Lowell. He previously served as executive assistant for NEES in Boston.

Holcomb, now Merrimack-Essex officer at Salem, has been vice president of Salem Electric, Gloucester Electric, and electric operations in Beverly since 1952.

Leddy comes to his new post from that of manager of Amesbury Electric Light Co. During his 37 year career with the system, he has held a number of managerial positions in the merchandising field.

Pike is former manager of Haverhill Electric Co. Since coming to the system in 1923 as student engineer, he has been distribution engineer, superintendent of delivery, and operating superintendent.

NEWELL A. CLARK

EDWARD F. ZIEGLER

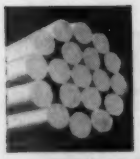
W. E CASEY

T. J. HICKEY

H. S. HOLCOMB

ALBERT LEDDY

RAY PIKE, JR



IF IT CARRIES CURRENT, K/W CARRIES IT!

AAAC*—A COMPARISON WITH ACSR, ALL-ALUMINUM AND COPPER CONDUCTORS

*"The initials AAAC are not a trade-mark of Kaiser Aluminum, but are regarded as a grade designation for All Aluminum Alloy Conductor (developed by Kaiser Aluminum). The initials are intended to be used freely throughout the industry in designating such products, as is the case with grade designation ACSR, Aluminum Conductor, Steel Reinforced. Since heat treatment and processing are critical, Kaiser Aluminum will sell carefully controlled wire on process reels to other fabricators for stranding and for covering. This will be done at a later date when testing is completed.

WHAT IS AAAC?

AAAC is a high-strength, high-electrical conductivity heat-treatable aluminum-magnesium-silicon alloy developed by Kaiser Aluminum. Through the combination of proper heat treatment and cold reduction, wire is produced having exceptional mechanical strength yet with electrical conductivity only moderately reduced from that of pure E.C. aluminum.

HOW DOES AAAC COMPARE IN EFFICIENCY?

$$\frac{\text{Tensile Strength} \times \text{Conductivity}}{\text{Specific Gravity}}$$

The above formula may be looked upon as a rough criterion for conductor metal efficiency in high-tensioned overhead line construction. Using this efficiency criterion, AAAC is:

1. 40% more efficient than hard-drawn copper
2. Almost twice as efficient as E.C. aluminum
3. 35% more efficient than ACSR.

HOW DOES AAAC INSTALLATION COMPARE?

AAAC is as simple to splice and dead-end as all aluminum or copper cables. For splicing, only a single compression sleeve is required. This eliminates the separate steel sleeve, and the cutting back of strands necessary when splicing ACSR. Automatic or preformed splices can develop the full strength of the conductor without special preparation. For dead-ending, suitable bolted-type clamps can develop the full conductor strength. All this means that in many cases fittings will be less costly than those for ACSR, installation time will be less, and rapid emergency repairs may be made more quickly even when the line must remain energized during repair. Armor rods used on ACSR can also be used satisfactorily on AAAC. Repair sleeves, armor rods, clips and other non-tension accessories are interchangeable due to same physical sizes.

WHAT ABOUT SIZES?

AAAC is designed in sizes to have the same DC resistance as equivalent ACSR conductors. (Diameter and breaking strength are approximately equal.)

WHAT IS CORROSION RESISTANCE OF AAAC?

AAAC is mono-metallic and the alloy has great inherent corrosion resistance. Galvanic corrosion, which may sometimes occur between the steel core wires and adjacent aluminum strands in an ACSR conductor in severe environments, cannot take place with AAAC.

WHAT ABOUT THE OPERATING COST OF AAAC?

For the same current carried AAAC will operate cooler than ACSR with a cost-saving and lower watt loss per foot of conductor. Both AC resistance and inductive reactance of AAAC at one foot spacings is approximately 10% lower than the equivalent ACSR in the normal distribution sizes and, for a given length, will have less voltage drop.

HOW DURABLE IS AAAC?

AAAC has about twice the Brinell hardness of hard-drawn E.C. aluminum. It will, therefore, not abrade as readily as all-aluminum or ACSR conductors during installation nor will it wear to the same extent in ties, dead-ends and clamps.

HOW DOES AAAC COMPARE IN TENSILE STRENGTH?

Since AAAC has the same metal area as ACSR and has the same average unit strength, the conductor strength will be the same as its ACSR equivalent.

WHAT ABOUT EXTRA HIGH VOLTAGE?

Kaiser Aluminum is currently cooperating with leading universities in the study of extra-high voltage applications of *both* AAAC and ACSR . . . in actual installations, in experimental lines and in laboratory investigations. Extensive preliminary experimental installations are now being evaluated.

As an industry leader in this increasingly important extra high voltage field—and as a leading supplier of both AAAC and ACSR—KW can give you unsurpassed service in any transmission problem.

For further information on these KW developments, or for immediate service on any wiring need, contact the Kaiser Aluminum sales office or the KW distributor listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Bldg., Oakland 12, California; *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois.

Kaiser Aluminum

IF IT CARRIES CURRENT, K/W CARRIES IT!

Nevada Utility Advances Johnson and Hoopes

Southern Nevada Power Co has appointed E. F. Johnson and D. R. Hoopes to fill the vacancies resulting from the retirement of D. D. Smalley, vice president and operating manager.

Johnson, general superintendent, will supervise the operation and maintenance of power plants and the construction, operation, and maintenance of distribution and transmission lines and substations. He will also be responsible for rate matters and the preparation of operating and construction budgets.

Hoopes, chief engineer, will be in charge of design, engineering, and construction of power plants. In addition, he will supervise design and engineering of transmission and distribution lines and substations.

E. F. JOHNSON

D. R. HOOPES

NIPSCO Elevates Morris

George L. Morris has been elevated from district operating superintendent of Northern Indiana Public Service Co to manager of electric operations.

In his new capacity, he will coordinate all electric operations and distribution of power throughout NIPSCO's 22 districts.

Succeeding Morris as Hammond district superintendent is Radford N. Hayden.

PERSONAL BRIEFS

Kentucky Utilities Co's engineering department has advanced **I. Bruce Irvine** to chief system operating engineer; **A. D. Langford** to chief transmission system engineer, **Royce H. McBeath** to chief distribution system engineer; and **M. W. Whitaker** to chief system control and communications engineer. **William B. Bechanan** has been made responsible for construction forecasts, network analyzer operation, facility relocation contracts, and drafting supervision.

William D. Burgess has joined El Paso Electric Co as assistant to the president.

At Potomac Edison Co, **John P. Coblentz** was elevated to manager of commercial marketing; **George O. Mullan** to manager of residential and farm marketing; **Lee W. Morgan** to system application engineer; and **Oscar Lashley, Jr,** to lighting supervisor.

Robert I. Bull will become commercial manager of Ohio Power Co's Southern Division on September 1 . . . Pennsylvania Electric Co has named **Harry B. London, Jr,** operating superintendent of the Northern Division.

Central Power & Light Co has appointed **Harold M. Mastin** chief plant engineer for its new J. L. Bates power station. Also advanced were **William M. Mayer,** to assistant superintendent of power stations, and **Clarence E. Voges** to manager, Three Rivers-West Gorge area.

William A. Hopkins, Jr, has been named to succeed **Clarence V. D. West** as superintendent for Virginia Electric Power Co's Clifton Forge district. West is now assistant substation engineer in the system engineering and construction department. **Carlton M. Stallings** was named district engineer, South Boston distribution department.

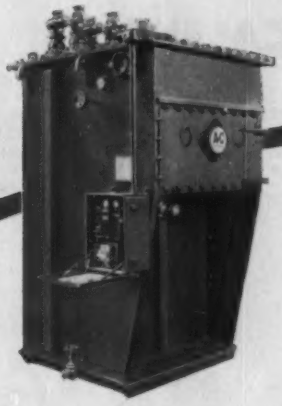
Paul E. Weiland has been appointed to the new post of director of utilities for Ohio Public Utilities Commission. Succeeding him as chief engineer is **Paul E. Hampton** . . . Georgia's Public Service Commission has named **Robert B. Alford** director of the utilities division.

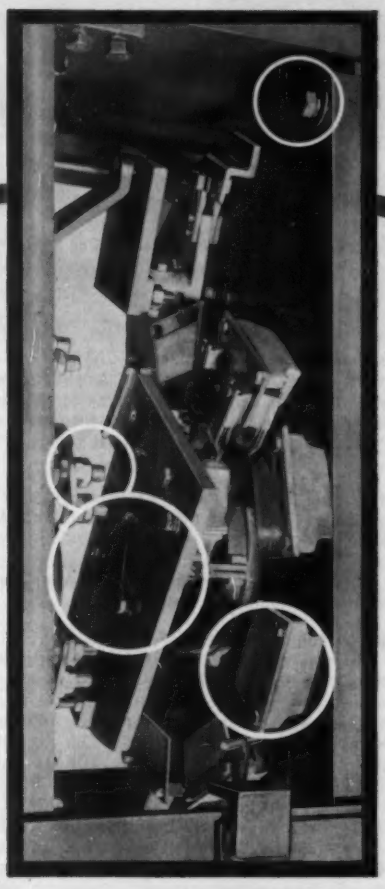
Tri-County Electric Co-op of South Carolina has elected **W. H. Norris** as manager to succeed **H. E. Roberts,** resigned . . . **Howard E. Scott** is new director of Colorado Rural Electrification Association.

C. A. Benz has been named to head the new nuclear engineering department of Peter F. Loftus Corp . . . Electrical Utilities Co has as its new chief engineer **Ralph H. Preiser.**

The small integral motor department of General Electric Co has named **David A. Hamilton** manager of product planning, advertising, and sales promotion; and **Frank J. Mongraw** manager of agent, distribution, and user sales . . . In the large lamp department, **Willard C. Brown** rose to manager of lighting education, **Arthur C. Barr** to manager of application engineering; **Joseph B. Foley** to manager of commercial and industrial sales; and **Samuel H. Hazleton** to manager, Mohawk sales district.

Sterling C. Spielman is new director of engineering for Philco Corp's Government and Industrial Division . . . Gould-National Batteries, Inc, has appointed **John P. Kelly** general sales manager, Industrial Division.





reasons for remarkable service of ALLIS-CHALMERS 3-phase regulators

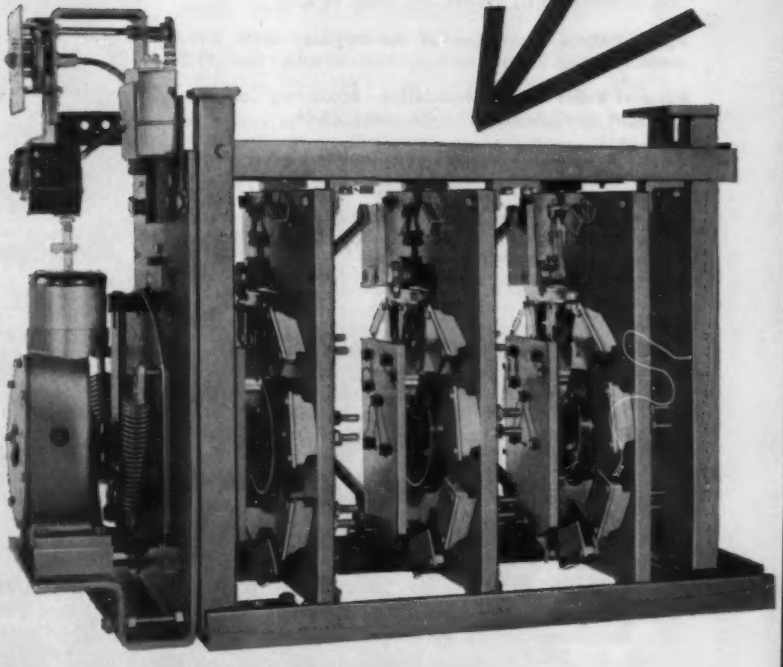
The extra heavy tap-changing mechanism is built to withstand the most severe operating conditions. From the rigid mounting frame of bolted and welded construction down to the smallest component, all parts are sized for long service life. In fact, a unit recently inspected after 20 years' operation showed no appreciable wear.

In addition, the quick-break tap changer operates on balanced spring principle—snubs fast moving parts to quick stop without shock.

Six types of locking devices add to rigidity of mechanism. Wired bolt heads, fine threaded bolts, prick punching, locking strips, lock washers, and nuts are all used to assure rigidity year in and year out.

These are only a few of the many reasons for the remarkable service record of Allis-Chalmers 3-phase regulators. For all the reasons, contact your local A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

rigid mechanism



A-5461

ALLIS-CHALMERS

MEETINGS CALENDAR

AUGUST

American Institute of Electrical Engineers—Pacific General Meeting, Pasco, Washington, Aug. 28-30.

SEPTEMBER

American Institute of Electrical Engineers—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pennsylvania, September 4-6; Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

• **Northwest Electric Light & Power Association**—50th Annual Meeting, Glacier Park Hotel, Glacier National Park, Montana, Sept. 5-6.

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Electric Companies Public Information Program—Steering Committee, New York City, Sept. 11; Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

Edison Electric Institute—Industrial Power & Heating Group, Van Curler Hotel, Schenectady, N. Y., Sept. 11-13; Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Sept. 23-25; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

• **Electric Companies Advertising Program**—Management Group Meeting, Hotel Pierre, New York City, Sept. 13; Copy Group Meeting, Detroit, Mich., Sept. 25.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Southeastern Electric Exchange—Engineering & Operation Section, Biltmore Hotel, Atlanta, Ga., Sept. 19-20.

Public Utilities Association of the Virginias—39th Annual Meeting, White Sulphur Springs, West Virginia, Sept. 19-21.

Missouri Valley Electric Association—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 23-24.

American Society of Mechanical Engineers—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

• **Inter-Industry Farm Electric Utilization Council**—National Power Workshop, Fourth Annual Meeting, Shirley-Savoy Hotel, Denver, Colo., Sept. 29-Oct. 1.

OCTOBER

• **Pennsylvania Electric Association**—50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 2-3; Communications Committees, Abraham Lincoln Hotel, Reading, Pa., Oct. 7-8; Meter Committee, Shenango Inn, Sharon, Pa., Oct. 10-11; Relay Committee, Abraham Lincoln Hotel, Reading, Pa., Oct. 17-18; Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 24-25; Transmission & Distribution Committees, Lord Baltimore Hotel, Baltimore, Md., Oct. 31-Nov. 1.

Indiana Electric Association — French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

Missouri Valley Electric Association—Sales & Rural Conference, (and Home Service Workshop), Lassen Hotel, Wichita, Kansas, Oct. 2-4.

International Association of Electrical Leagues—Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

National Industrial Conference Board—Atomic Energy Course for Management, Hotel Moraine on the Lake, Highland Park, Ill., Oct. 6-12.

Iowa Utilities Association — Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 7-8.

Edison Electric Institute—Prime Movers Committee, Hotel New Yorker, New York City, Oct. 7-9; Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 9-11; Transmission & Distribution Committee, Statler Hotel, Boston, Massachusetts, October 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Virginia, Oct. 23-25.

American Society of Mechanical Engineers—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Royal York Hotel, Toronto, Canada, Oct. 7-9; Power Conference, American Hotel, Allentown, Pennsylvania, Oct. 21-23.

National Electronics Conference, Inc—13th Annual Meeting, Hotel Sherman, Chicago, Ill., Oct. 7-9.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Ill., October 7-11; Computers in Control Symposium, Hotel Claridge, Atlantic City, N. Y., Oct. 16-18.

• **Electrical Association of Philadelphia**—15th Electrical Progress Show, Convention Hall, Philadelphia, Pa., Oct. 8-10.

Southeastern Electric Exchange—Accounting Section, Fort Sumter Hotel, Charleston, S. C., Oct. 10-11; Sales Section, Tutwiler Hotel, Birmingham, Ala., Oct. 16-18.

Rocky Mountain Electric League—54th Annual Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 13-17.

Interstate Power Club—Hotel Martinique, New York City, N. Y., Oct. 14.

• **National Safety Congress**—Conrad Hilton Hotel, Chicago, Ill., Oct. 21-25.

Oklahoma Utilities Association — Electric Light and Power Division, Woodward, Okla., Oct. 25; Eastern District, Bartlesville, Okla., Oct. 25.

Atomic Industrial Forum—Annual Conference, New York City, Oct. 28-30.

American Nuclear Society—Winter Meeting, New York City, Oct. 28-30.

National Association of Railroad Utilities Commissioners—Annual Conference, Peabody Hotel, Memphis, Tennessee, October 28-31.

Industrial Management Society—21st Anniversary Industrial and Management Clinic, Hotel Sherman, Chicago, Ill., Oct. 30-Nov. 1.

Institute of Radio Engineers—3rd Annual Technical Conference of the Professional Group on Electron Devices, Shoreham Hotel, Washington, D. C., Oct. 31-Nov. 1.

NOVEMBER

Edison Electric Institute — Accident Prevention Committee, Penn-Sheraton Hotel, Pittsburgh, Pa., Nov. 6-8.

• Additions this week.

A-5461 ALLIS-CHALMERS

In this 850-tower 230-KV line . . .

USS MAN-TEN High Strength Steel saves 1000 lbs. per tower

BY THE SELECTIVE USE of USS MAN-TEN Steel, a total of 425 tons of steel was saved in this 205-mile double circuit line—a substantial weight reduction that paid off handsomely.

For by cutting one-half ton of weight off each transmission tower, the initial cost of the structures was reduced. In addition, with 425 tons less to move, the cost of transportation was cut, erection was faster and easier.

Weight is an important factor in determining transmission tower costs, particularly when the line runs through rough, hard-to-reach country or where much off-road hauling is involved. Every pound of weight saved means money saved.

That's why it will pay you to investigate the advantages that weight-saving construction with USS MAN-TEN Steel offers you.

USS MAN-TEN Steel has a yield point 50% higher than structural carbon steel—yet it costs very little more. Its higher strength makes it possible to reduce the thickness—and the weight—of tower legs, cross arms and bracing members without any sacrifice in strength and durability. Its low cost makes such weight reduction both practical and economical.

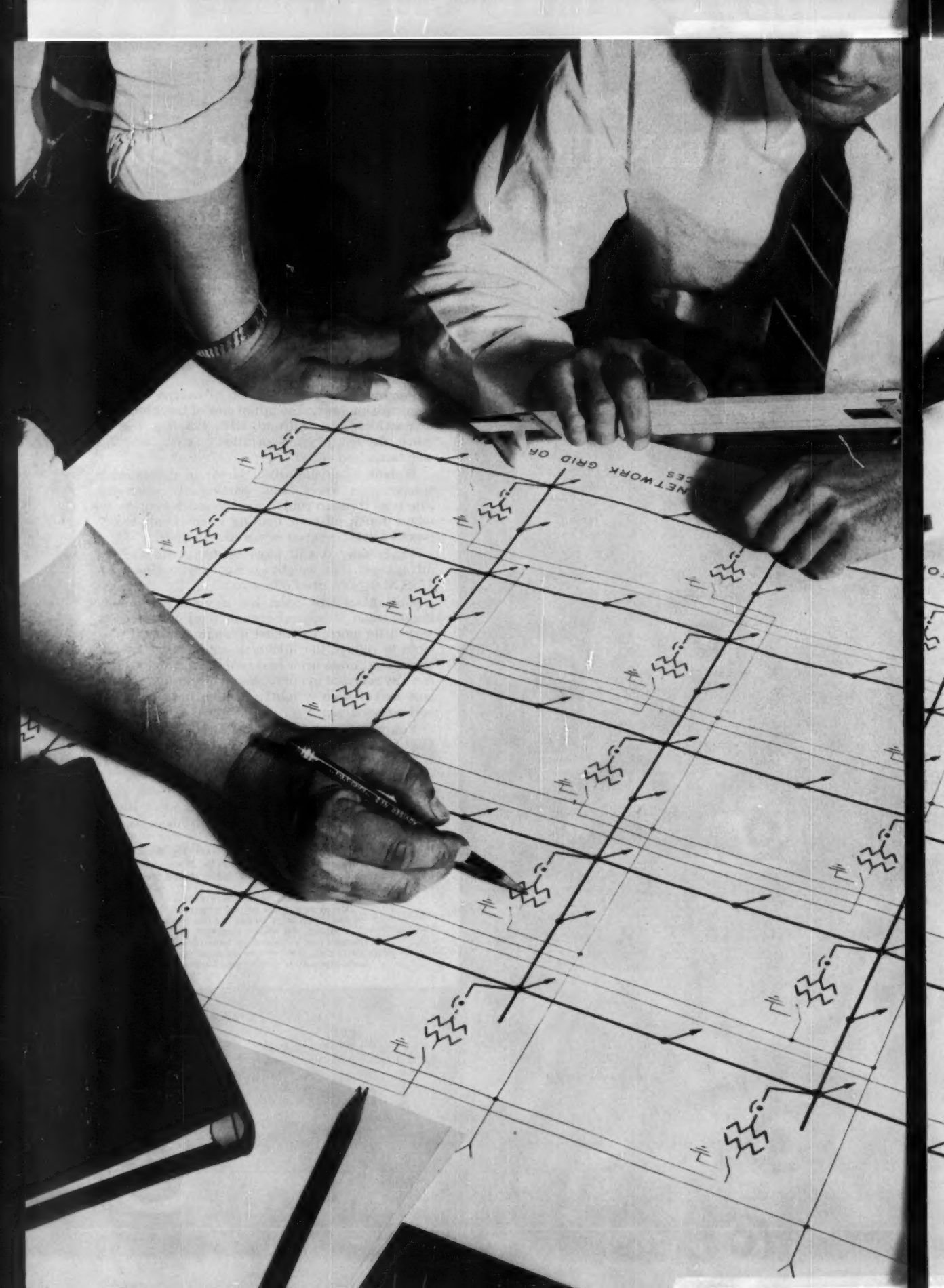
You will find our 174-page "Design Manual for High Strength Steels" extremely useful in applying USS MAN-TEN and our other famous high strength steels, USS COR-TEN and USS TRI-TEN "E," to your designs. For your free copy, write—on your company letterhead—to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

This Bureau of Reclamation line runs from Big Bend, South Dakota, 205 miles northeast to Granite Falls, Minnesota. Towers were fabricated by American Bridge Division, United States Steel.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS
24 YEARS OF PERFORMANCE

UNITED STATES STEEL



WORRIED ABOUT LOAD GROWTH?

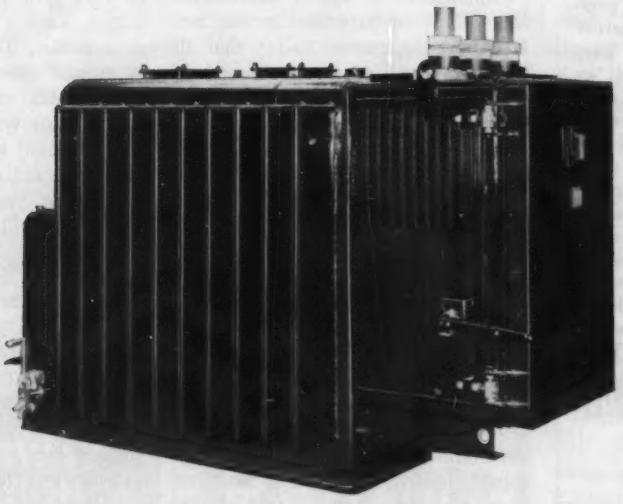
The time is now, isn't it? Time to reconsider your anticipated growth areas?

With experts predicting 300% load increase in the next twelve years, compared to 100% each decade in the past, it's a rare distribution engineer who doesn't find himself confronted with a new rash of problems.

To handle these problem areas, many progressive utilities already have their network systems in operation, or well into the planning stage. Since the first automatic a-c secondary network was installed in New York City in 1922, experience has proved their superior service in high-density, rapid-growth areas. Today, over 280 cities throughout the country already are enjoying the advantages of a-c secondary network distribution.

Check the experience of the networks close to you. Westinghouse engineers stand ready to cooperate with you and your consultants on network studies. Westinghouse equipment can simplify your conversion and expansion problems. J-97200

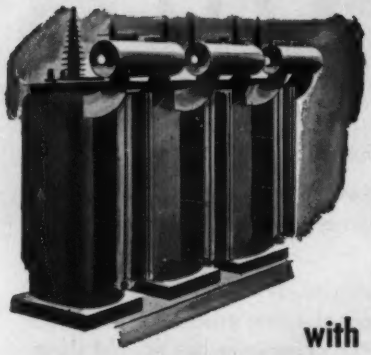
YOU CAN BE SURE...IF IT'S Westinghouse



New Westinghouse Space-Miser network transformer, shown with protector mounted to the low-voltage throat. Unit pictured is 750-kva, 15-kv class transformer with 2500-ampere protector.

In addition to standard ratings in all classes, Westinghouse has developed network protectors for heavy, medium and light load density, 120/208-volts and 265/460-volts.

Seal oil IN!
Seal moisture OUT!



with
J-M TRANOLSEAL
developed especially for efficient sealing against refined oils

You can stop the dangerous and costly leakage of oil from transformers and switchgear with Johns-Manville's Tranolseal sealing compound. This permanently plastic material has a nondrying vegetable oil base. It provides effective sealing action against air (dust and moisture), inert gas, water, 13% NaCl brine as well as medium to high viscosity refined oils. Thus you can also prevent penetration by moisture and other ambient sources of trouble.

Tranolseal has excellent adhesive qualities and will not corrode or deteriorate metals, rubber or plastics. It shows good resistance to weather and aging (both painted and natural) and won't stain. Furnished in 1" diameter beads. For further information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

JM

Johns-Manville
SEALING COMPOUNDS

Measure Quality of Transformers

(*Continued from page* 58)

reduced densities. If the densities had not been reduced, the same 10% reduction in loss product factor would be obtained, but with a 20% increase in kva rating. This observation leads to a formal proof of the first part of statement 8.

Geometrically similar core and winding structures for transformers of normal design give loss product factors inversely proportional to the square of their linear dimensions, while kva ratings are directly proportional to the fourth power of these dimensions. Thus, loss product factor should vary inversely as the square root of the kva ratings. In practice, core and winding structures of transformers with the same type of cooling and the same BIL but different kva ratings are not exactly similar in geometry. Even the values of (w_1) and (w_2) are likely to vary somewhat with large variations in kva ratings. Yet, broadly speaking, loss product factors of transformers do vary inversely as the square root of the kva ratings, as in Fig 2.

For any given kva rating, transformers of higher BIL's have larger insulation spacings and consequently higher values of the ratios $\frac{L_1}{A_2}$ and $\frac{L_2}{A_1}$. This establishes the relation between BIL's and loss product factors and completes the proof of statement 8.

Statements 4 and 5 summarize the effects of progress in the art. It is no exaggeration to say that all the effort and success achieved in some 70 years of making a transformer a better power-transforming device are reflected in the loss product factor formula.

The gradual decrease in typical values of watts per cu in. in the core iron at the reference flux density (w_1) is one indication of the progress in the art. It should be realized, of course, that (w_1) depends not only on the basic quality and processing of the steel, but also on core design and construction. Dimensions and insulation of individual laminations, quality of joints, uniformity of flux distribution, and degree of control of flux harmonics are some of many factors in the latter category.

Progress in the art has resulted in lower typical values of watts per cu in. of the winding copper at the reference current density (w_2). Although practically fixed as far as the basic material is concerned (unless some metal other than copper is used), values of (w_2) are subject to wide variation due to eddy current and stray losses. These additional losses depend on the design, because they are caused by a variety of internal parasitic currents. These currents are proportional to load current and circulate inside individual strands, between imperfectly transposed strands, between imperfectly balanced multiple circuits, and in structural parts of the transformer.

Considering once more the ratios $\frac{L_1}{A_2}$ and $\frac{L_2}{A_1}$, progress in the art has comprised, on one hand, improvements in the shapes, proportions and arrangements of the two circuits to minimize the values of these ratios with any given insulation and ventilation allowances. On the other hand, progress has consisted of reducing these allowances as soon as justified by research in insulation and heat transfer.

For statements 6 and 7, the loss ratio formula shows that changes in relative values of flux and current densities (relative amounts of iron and copper), although they have no or very little effect on loss product factor, have a telling effect on loss ratio factor. This is shown in Fig 1. A more rigorous investigation of the practical range of values of loss ratio factor would require bringing in additional interrelations with reactance, exciting current, and noise.

Postwar years have been a period of rapid advances in transformer technology and high-volume production. In the experience of the author's company, important advances in the art could be incorporated first only in a few "prototype" designs and then only in relatively small segments of the total power transformer line. Benefits of improved loss guarantees now can be extended to the whole line of power transformers. This is shown in terms of loss product factors and loss ratio factors in Table II.

SALES ASSIGNMENTS

COMPANY STAFFS

Bristol Co's new Portland, Ore., sales office will be headquarters for Lyle R. Koroch, newly named sales engineer for the territory.

Elliott Co has named H. J. Campbell as Kansas City district manager.

Four Wheel Drive Auto Co has designated Wilfred R. Lewis as a district sales manager for its Pacific Northwest territory. From Seattle offices, he will handle sales in Washington, Oregon, Idaho, Alaska, and British Columbia.

General Electric Co's insulator department has appointed Richard Pyle as district sales manager of the Chicago district, which includes Wisconsin, upstate Illinois, eastern Iowa, northern Michigan.

Line Material Industries has as its new field engineer in Melrose Park, Ill., Stanley D. Reed.

Okonite Co has named H. Lindley Hosford to succeed J. G. Wicks as district manager of its Philadelphia office. Wicks is now regional sales manager.

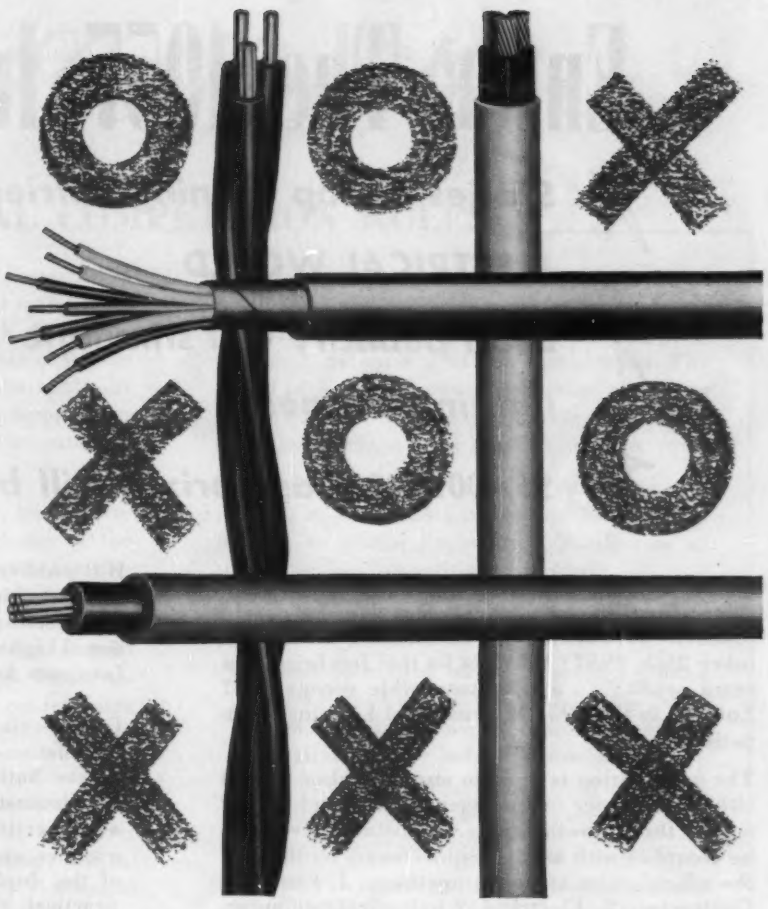
Orangeburg Manufacturing Co, Inc, has appointed Carl F. Arnold, Joseph E. Milardo, and Richard Ohlson as district sales managers of the Central Middle Atlantic, North Central, and Pacific Northwest districts, respectively.

Rockbestos Products Corp's George La Breacht is new sales engineer in the St. Louis area. The firm's new office in the area is located at Lambert-St. Louis Municipal Airport, St. Louis 21, Mo.

Standard Transformer Co has designated Wilson P. Byrd as sales representative in North and South Carolina.

Sylvania Electric Products, Inc, has announced the appointment of Samuel H. Eaton as manager of special accounts for its Lighting Division, with headquarters at the regional sales office in Chicago.

COATES Field Service, INC.
P. O. Box 1581 Okla. City
Thoroughly Specialized
RIGHT-OF-WAY ACQUISITION
From Title Search . . .
. . . To Damage Claims



Beat high cable costs in 3 easy moves...

One, make sure that the cables you specify are designed and made to offer maximum service life with minimum maintenance under the toughest conditions. Collyer Cables will more than meet your highest standards. **Two,** save yourself time and trouble by ordering your complete cable requirements from one dependable source of supply. Collyer Engineers can match your exact specifications quickly and easily. **Three,** act now and get the first-hand facts on Collyer Cables. Write, wire or phone **Collyer Insulated Wire Co., 245 Roosevelt Ave., Pawtucket, R. I.**

LIVE BETTER ELECTRICALLY

Collyer

Power Cables • Control Cables • Switchboard Wires • Service Wires • Series Lighting Cables • Building Wires

TO BUILD YOUR LIGHTING BUSINESS . . .

Enter The 1957 International

Stories on top winning entries will be published in ELECTRICAL WORLD

Local publicity will stimulate lighting business!

$5,400.00 in cash prizes will be awarded!

Have you completed an outstanding lighting job since January 1st, 1956? Do you have one planned—or working—to be finished before October 25th, 1957? Why not let that job bring you extra profit . . . and industry-wide recognition? Enter it in the 1957 International Lighting Competition!

The competition is open to any individual who is either the owner or manager, or an employee of any of the following types of business, provided he complies with all the requirements outlined in the official rules of the competition: 1. Electrical Contractor. 2. Electrical Wholesale Distributor. 3. Architect or Engineer. 4. Electrical Utility.

The contest opens March 15th, and closes October 25th. Announcement of award winners will be made during the week of November 11, 1957.

The competition is sponsored by three McGraw-Hill publications: Electrical World . . . Electrical Construction and Maintenance . . . Electrical Wholesaling . . . with the cooperation of the National Lighting Bureau (National Electrical Manufacturers Association).

Commercial, industrial and institutional lighting installations winning cash prizes will be certified by the National Lighting Bureau, NEMA, providing the installation plans meet certification standards. Certificates will be presented to all cash prize winners, and honorable mention winners. In case of tie, duplicate awards will be made. Wherever practical, awards will be made locally; if possible at electrical group meetings.

Send in the coupon below for detailed information on the 1957 International Lighting Competition. Make your outstanding lighting job pay off in extra cash, and valuable public acclaim!

LIGHTING CLASSIFICATIONS:

Lighting installations are divided into six separate and individual groups. Separate awards will be made for each classification, within each contestant division. The installation classifications are:

1. **Industrial**
2. **Store**
3. **Office**
4. **Institutional**
5. **Outdoor Lighting**
6. **Residential Lighting**

PRIZE AWARDS:

The 120 cash prizes offered, total $5,400.00. There are five prizes for each of the six installation classifications, and these prizes are offered within each of the four contestant divisions. The prize awards for each classification and within each division:

First Prize: $100

Second Prize: $50

Three Prizes: $25 each.

JUDGING:

Competent and fair consideration for each entry has been assured through appointment of nine individuals, each a well-known authority in the field of illumination, to serve as judges. These individuals will form three panels of three members each, to judge the separate lighting classification groups. The decisions of the board with respect to awards and all other competition matters are final and binding on each participant. The competition and awards are subject to all applicable local, state and federal laws and regulations.

Lighting Competition!

OFFICIAL COMPETITION RULES:

RULE 1 – Application to enter the Competition must be made in writing. Applicant may use an Official Entry Application form, which will be supplied by the Lighting Competition chairman upon request. (In any case where the applicant is unable to obtain an Official Entry Application form, he may send in his request to enter by letter).

RULE 2 – Any individual–who may be the owner or manager, or an employee of any of the following types of business – may enter the contest. These types of businesses, which are to be known as Contestant Divisions, are: electrical contractor; electrical wholesale distributor; architect or engineer; and electric utility. Either individual or joint entries may be made; joint entrants must specify which Contestant Division they are entering.

RULE 3 – Entries must be made in one of the following Installation Classifications: industrial lighting; store lighting; office lighting; institutional lighting; outdoor lighting; residential lighting.

RULE 4 – Contestants or their firms must have been responsible for either the design, layout, sale or installation of the lighting installation covered by each entry. The contestant will state this eligibility by describing in detail in each entry the part he took in the design, layout, sale or installation. In the case of joint entries, each contestant must state in the entry the work for which he was responsible.

RULE 5 – A contestant may submit any number of entries.

RULE 6 – Each entry must cover one or more of the following:

a. A lighting installation for a single specific visual requirement.
b. A lighting installation for a specific area, large or small.
c. An overall lighting installation for an entire building, project or general area.

A lighting installation using any make, or brand, or type of electric lighting equipment, and based on any lighting system design or layout, regardless of whether such lighting equipment, lighting system design or layout conforms with recognized standards for good lighting practice, may be enter 1 in the Competition. The Board of Judges, however, will judge all entries based on those factors conforming with recognized standards of good lighting practice.

RULE 7 – Each entry must be submitted separately, in an official Competition Entry folder bearing an official Registration Number as assigned by the Competition chairman.

RULE 8 – All entries, to be eligible in the Competition:

a. Must be mailed on or before the closing date of the Competition (October 25, 1957), and must be received by the Competition chairman on or before November 4, 1957.
b. Must cover lighting installations completed within the period between January 1, 1956 and October 25, 1957.

RULE 9 – In submitting an entry, the contestant agrees to be bound by all rules of the Competition, and to abide by the decision of the Board of Judges, which will be final. All entries become the property of the sponsors of the 1957 International Lighting Competition, and no entry will be returned. All entrants, by submitting entries, further agree to grant the sponsors full reproduction and publication rights.

MAIL THIS COUPON FOR RULES AND ENTRY FORMS:

Berlon C. Cooper, Chairman
1957 International Lighting Competition
330 West 42nd Street
New York 36, N. Y.

Please send me the rules brochure and ____ entry forms for the 1957 International Lighting Competition.

Name _____

Company _____

Address _____

City _____ Zone ____ State _____

PROFESSIONAL SERVICES

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

ELECTRICAL TESTING LABORATORIES, INC.
2 East End Ave. New York 21, N. Y.
Electrical, Electronic, Environmental, Photometric and Chemical Laboratories. Testing, Research, inspection and Certification.

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design
Engineers . . Purchasing
Specialists in Financing
Accounting and other Operations
231 So. La Salle St. Chicago 4

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Endfield St. Hartford, Conn.

HOOSIER ENGINEERING COMPANY
Erection and Maintenance of
Electrical Transmission and Distribution Lines
1384 Holly Avenue, Columbus, Ohio

SARGENT & LUNDY
Engineers
140 South Dearborn St.
Chicago, Ill.

COMMONWEALTH SERVICES INC.
Management and
Business Consultants
300 Park Ave.
New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design
Engineers
209 E. Washington
Jackson, Michigan

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Investigations—Depreciation Studies—
Cost Trends—Reports
for Rate Cases, Security Issues, Regulatory and
Accounting Requirements
Original Cost and Continuing Property Record
Determination
Ann Arbor, Michigan

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street Abilene, Texas

DAY & ZIMMERMANN, INC.
Engineers & Constructors
Transmission & Distribution Lines
Substations
Design & Construction
Reports - Valuations - Rates
Industrial & Utility
New York PHILADELPHIA Chicago

M. W. KELLOGG
Piping System Flexibility Analyses
Unique model tester as well as modern digital computer facilities available for low cost, accurate flexibility analyses of the most complex piping systems.
The M. W. Kellogg Company
711 Third Ave., New York 17, N. Y.

READERS MAY CONTACT
the consultants whose cards appear on this page with the confidence justified by the offering of these special services NATIONALLY.

SEARCHLIGHT SECTION

TRANSFORMERS

3—1000 KVA Penn 33000-2500/4330Y
3—1000 KVA Mol 13200-2400/4160Y
3— 667 KVA Mol 2400-480
3— 500 KVA W-H 33000-2400/4160Y
3— 500 KVA G-E 22000-2300/4000Y
3— 333 KVA Mol 2300—230x460
3— 333 KVA Penn 2400—240/480
3— 250 KVA W-H 22000-7200/12470Y
3— 200 KVA Mol 7200-2400/4160Y
3— 167 KVA W-H 13200-240/480
4— 100 KVA A-Ch 33000-7200
4— 100 KVA W-H 22000-6900
50— 100 KVA Cent 13800-240/480
50— 50 KVA Cent 13800-120/240

Many other items in stock

TRANSFORMERS WANTED
Reliable rewind and repair service
on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio
45 Year's Dependable Service

ENGINEER
Electrical and/or Mechanical for position in headquarters service department of manufacturer of large industrial motors and controls analyzing application and operational problems. Unusual opportunity for experienced man who prefers stimulating work.
J. H. JONES
ELECTRIC MACHINERY MFG. CO.
800 Central Ave. Minneapolis 13, Minn.

FOR SALE

RISE SHUNT REACTORS

1—WEMCO	3000 KVA	34.5 KV	TYPE OA	3 Ph	60 Cyc
1—WEMCO	2000 KVA	34.5 KV	TYPE OA	3 Ph	60 Cyc
1—WEMCO	1500 KVA	24.9 KV	TYPE DA	3 Ph	60 Cyc
1—WEMCO	1500 KVA	24.9 KV	TYPE DS	3 Ph	60 Cyc

Location, Western South Dakota. All approximately three years old. In excellent condition. For further information write

RUSHMORE G & T ELECTRIC COOPERATIVE
Route 2, Box 92 Rapid City, S. D.

ELECTRICAL DESIGNERS

Conduit and physical layout men. Control and wiring exp. desirable but not necessary. Work in air conditioned offices of a leading hydroelectric consultant in Chicago. Good starting salaries and liberal fringe benefits. Challenging work and opportunity for advancement. Please send complete resume to Hugo Hiemi, Personnel Manager

HARZA ENGINEERING CO.
400 West Madison Street Chicago 6, Ill.

When Answering
BOX NUMBERS . . .
to expedite the handling of your correspondence and avoid confusion, please do not address a single reply to more than one individual box number. Be sure to address separate replies for each advertisement.

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

Representatives calling on engineering and purchasing departments of large industrial, drilling, and mining operations to sell top quality line of electrical transformers, equipment, wire, cable, etc. Need additional men for tighter coverage of all territories. Liberal commissions. RW-5828, Electrical World.

BUSINESS OPPORTUNITIES

Manufacturers' Agent covering Federal Government, utilities, jobbers, contractors in Md.-Va.-DC-Del. desires bare wire, weatherproof wire, building wire, varnished cambric wires and cables, messenger strand, constant current transformers, poles, or related lines. BO-5817, Electrical World.

Electrical Thermal Control Fuses Patent No. 2,772,333 available for commercial exploitation in the U. S. Apply BO-5941, Electrical World.

Advertising in This Issue

Allis-Chalmers Mfg. Co....4th Cover 8, 9, 85, 109
American Chain & Cable, Page Steel & Wire Div..... 98
Anaconda Wire & Cable Co...92, 93
Anderson Electric Corp.....32, 33

Bakelite Co., Div. Union Carbide Corp. 10
Bethlehem Steel Co..... 38
Blackburn Corp., Jasper..... 75

Chase Brass & Copper Co..... 96
Coates Field Service, Inc..... 115
Collyer Insulated Wire Co..... 115

Delta-Star Electric Division, H. K. Porter Company, Inc.... 95
Directory of Engineers..... 118

Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc. 97
Elliott Company 11
Engineers, Directory of..... 118
Enjay Company, Inc..... 81

Fargo Mfg. Co., Inc..... 6

G&W Electric Specialty Co..... 71
General Electric Co. Apparatus Dept.....2nd Cover
Graybar Electric Co., Inc..... 7

Holan Corp., J. H..... 83
Hoosier Engineering Company... 25

Ingalls Iron Works Co..... 120

Johns-Manville 114

KPF Electric Co.....34, 35
Kaiser Aluminum & Chemical Sales, Inc. 106, 107
Kearney Corp., James R.....14, 15
Keasbey & Mattison Co..... 16

Lapp Insulator Co., Inc.....26, 27
Line Material Industries..... 23

Moloney Electric Co.....3rd Cover

Ohio Brass Co.....39, 40, 41, 42
Okonite Co., The..... 4

Page Steel & Wire Div., American Chain & Cable..... 98
Palnut Company 82
Pennsylvania Transformer Div., McGraw-Edison Co..... 17
Preformed Line Products Co..... 28

RT&E Corp. 79

S&C Electric Co..... 18
Sangamo Electric Co.....36, 37
Searchlight Section 118
Southern States Equipment Corp. 24
Standard Oil Co. (Indiana)..... 29
Standard Transformer Co.....72, 73
Stone & Webster Engineering Corp. 103

Union Carbide Corp., Bakelite Co. Div..... 10
United States Steel Corp..... 111

Victor Insulators Div., I-T-E Circuit Breaker Co., Inc. 77

Wagner Electric Corp..... 104
Westinghouse Electric Corp...12, 13 30, 31, 87, 88, 89, 90, 112, 113

■

PROFESSIONAL SERVICES..... 118

■

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES..... 118

EQUIPMENT (Used or Surplus New) For Sale 118

You're on target... in Electrical World

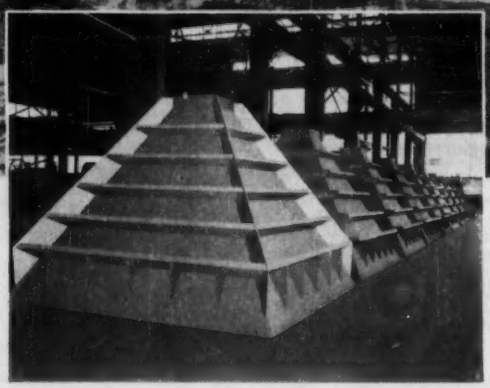
if you want to reach anyone concerned with the large-scale generation, transmission, distribution or utilization of electricity . . . because that's the length, breadth and height of ELECTRICAL WORLD's audience of 26,000 *all-paid* subscribers . . . in the utilities and big industry, among electrical manufacturers and consultants. No other magazine covers the *entire* Electric Power Industry, no other magazine commands the loyal attention of the industry. For further fast, fact-full information, write for "Quick Facts" . . . Electrical World, 330 West 42nd St., New York 36. N. Y.

INGALLS steel service
. . . a package for power

Structural steel for all ten units of the TVA plant at Johnsonville, Tennessee, will be fabricated by The Ingalls Iron Works Company. Shown here are the first four units. Units 5 and 6 have since been completed and Ingalls is now fabricating the steel for the new units 7, 8, 9 and 10. Its division, Birmingham Tank Company, fabricated the coal hoppers (inset) for this steam plant and will do likewise for the new units.

Ingalls, the nation's largest independent steel fabricator, has served 46 of the nation's leading power companies in 22 states. In many instances the Ingalls Plants have worked together as a team or, working separately, have furnished either the fabricated steel, plate work, or erection. If you are contemplating a new structure, call on Ingalls—for 47 years fabricators of steel.

FABRICATING STEEL IS OUR BUSINESS



For Strength and Economy Use FABRICATED STEEL

THE INGALLS IRON WORKS COMPANY

Established 1910

BIRMINGHAM, ALABAMA

Plants: Birmingham, Ala., Verona, Pa., North Birmingham, Ala., Decatur, Ala., Pascagoula, Miss.

WHEN SPACE IS PARAMOUNT

New Switch Design For Moloney Network Transformers Saves Installation Space

You gain 5 inches of valuable vault space because Moloney's new high voltage switch is now 5 inches narrower than formerly. This results in an overall reduction in the length of network transformers, and permits more work space in old vaults . . . or reduced excavation costs on new vaults.

Moloney's new switch has the same liberal current carrying capacity as formerly. Electrical clearances have not been altered. In every way, Moloney's new switch meets NEMA standards fully . . . PLUS Moloney's own high standards of performance dependability.

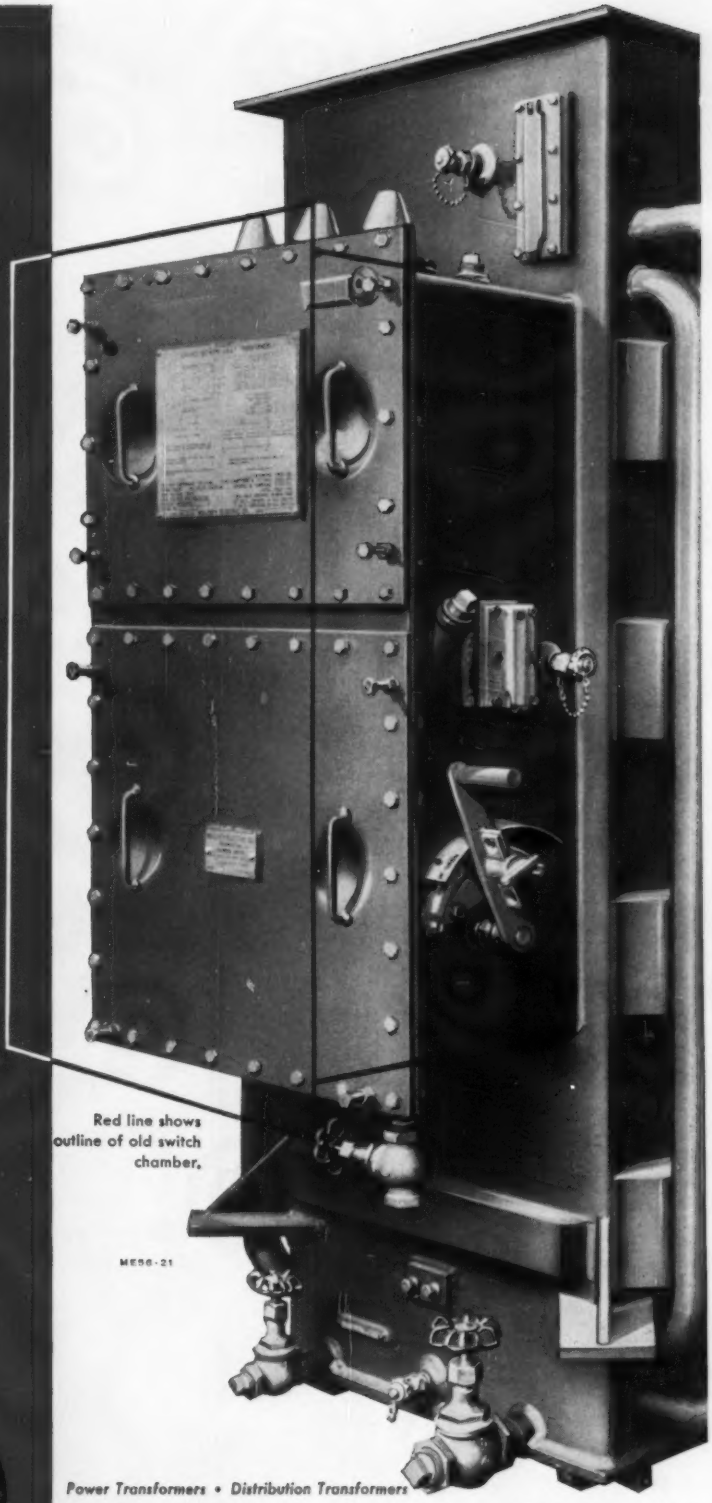
Save time. Save money. SAVE SPACE. Specify Moloney Network Transformers. They're engineered to provide dependable, continuous service for your network system.

MOLONEY ELECTRIC COMPANY

All Moloney Network Transformers feature positive, fool-proof, high voltage switches that conform to NEMA standards.

MOLONEY ELECTRIC

SALES OFFICES IN ALL PRINCIPAL CITIES



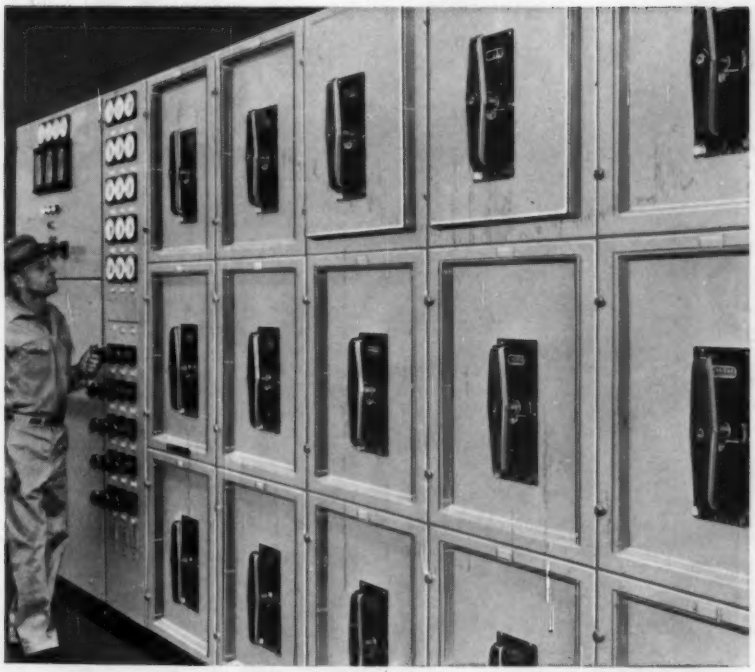
Red line shows outline of old switch chamber.

ME56-21

Power Transformers • Distribution Transformers
Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators
Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Transformers and Inductors for Electronics

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CAN.

ALLIS-CHALMERS
low voltage
switchgear



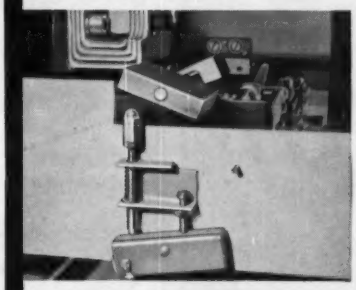
"Out in Front"

IN every way, this is outstanding switchgear. Whether it's the sleek-looking, two-tone outdoor gear with the inner service aisle . . . or the neat, compact indoor gear, you get the latest in features, design and construction.

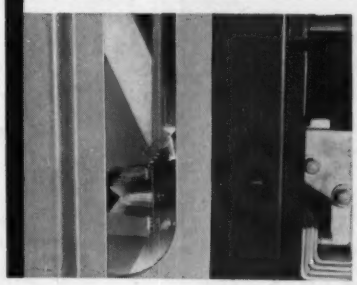
Check these features... then...

Get complete details. Call your nearby Allis-Chalmers office or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

"Out in Front" with the contoured door panel that provides exclusive breaker storage inside cubicle.



Panel is shown in its reversed or protruding position to provide additional space in the closed cubicle when breaker is in test or disconnected position.



Safety first! Positive mechanical trip interlock automatically trips the breaker if anyone tries to move it in or out of the operating position while breaker is closed. Note also that breaker operation can be checked in test position with door closed or open.

Extra convenience. Movable primary and secondary disconnects are easily inspected through large cut-out on each side of breaker mounting frame. It's not necessary to remove breaker from mounting for this inspection.

A-5418

ALLIS-CHALMERS